SOUTHERN POWER AND INDUSTRY

DECEMBER, 1956

SPI . . . 53rd Year

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SERVES plant managers, superintendents, engineering department heads and plant operating staffs.

PROVIDES information to solve design, installation, operating and plant maintenance problems.

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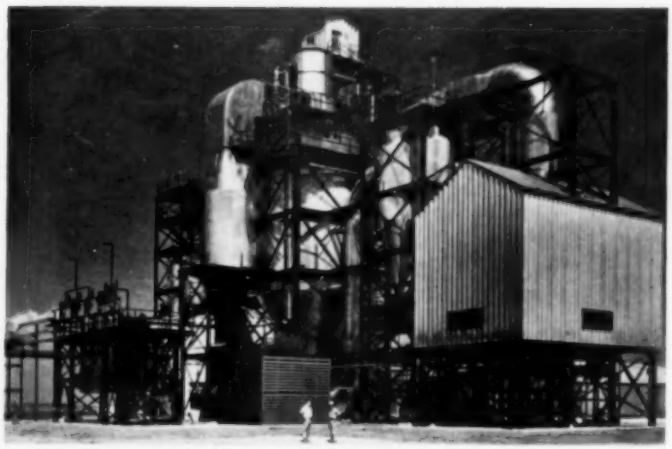
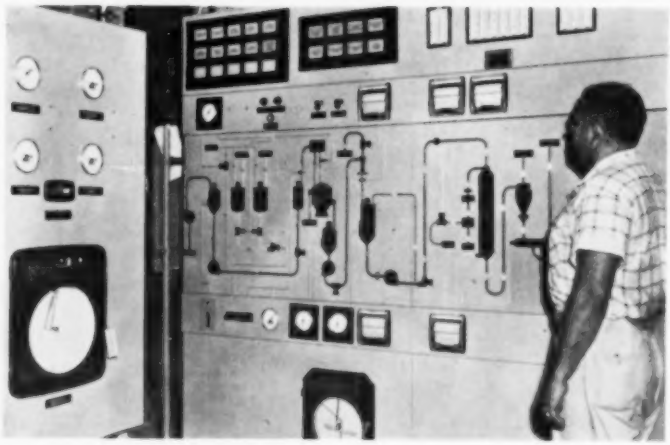
New Spray-Drying Installation





CORPUS CHRISTI, TEXAS—Looming 88 feet over two men in foreground is all-stainless steel spray-drying chamber of Corn Products Refining Company. The out-door unit produces Snow Flake Instant starch.

Spray-drying operation is so nearly automatic, it is accomplished by only two men and this single control panel. Keeping an eye on the instruments is George Hancock, supervisor of the unit.

for cooling tower application...

There's MORE protection against humidity in Allis-Chalmers MOTORS

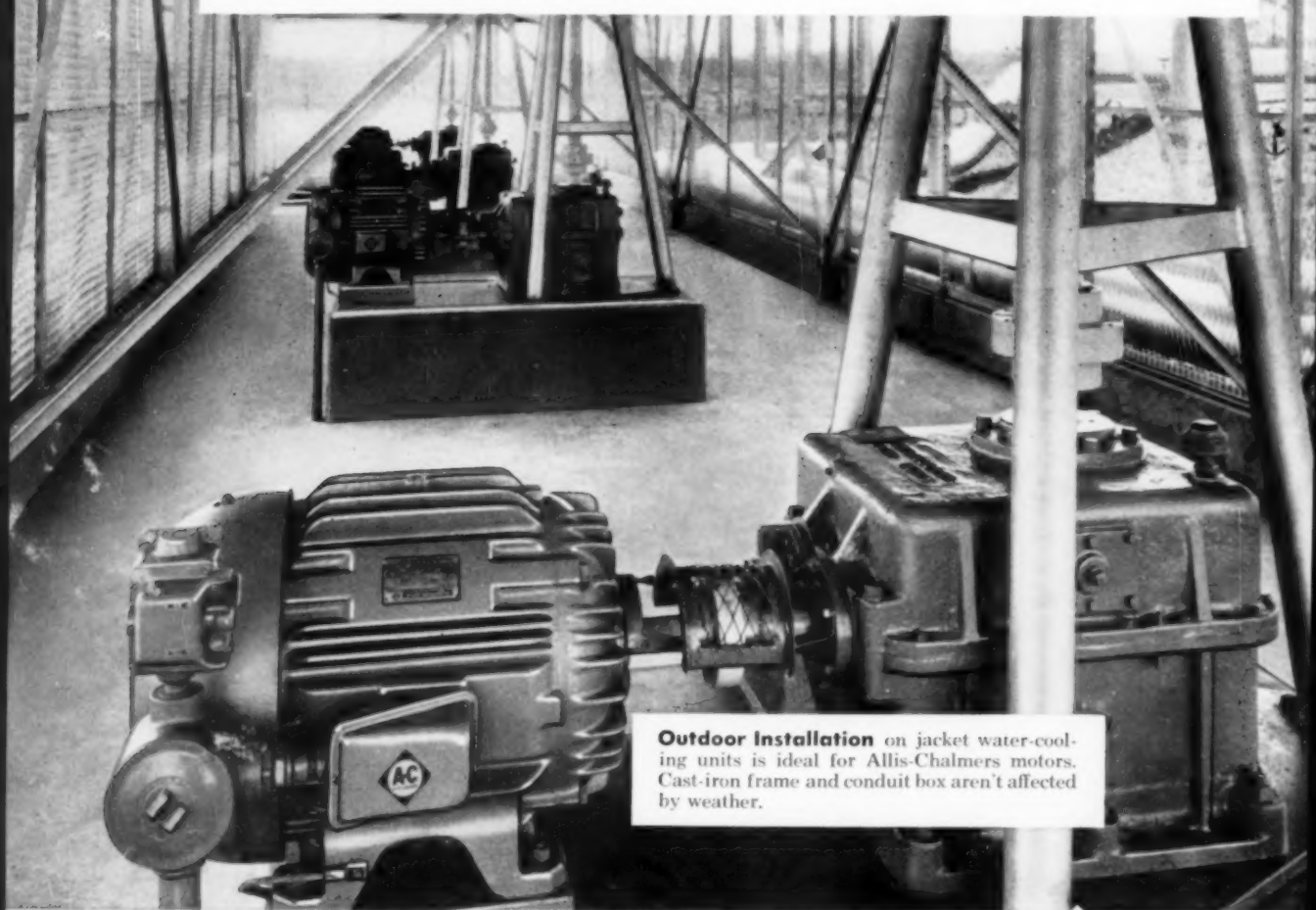
The ultimate in protection against high humidity — major cause of cooling tower motor failure — is provided tower builders and users in Allis-Chalmers TEFC motors. Here's why:

1. **Moisture drainage** — Drain plug can be removed to eliminate condensed moisture in the motor. (Particularly helpful in intermittent operations where condensation is more likely.)

2. **Extra-insulated stator** — Several applications of special insulating varnish plus repeated baking keep humidity out . . . give the long electrical life you need.

3. **Weather-protected bearings** — Rotating seal, turning in close running clearances, guards against entry of water.

Find out more about the "MORE" in Allis-Chalmers motors by contacting your nearby A-C sales office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.

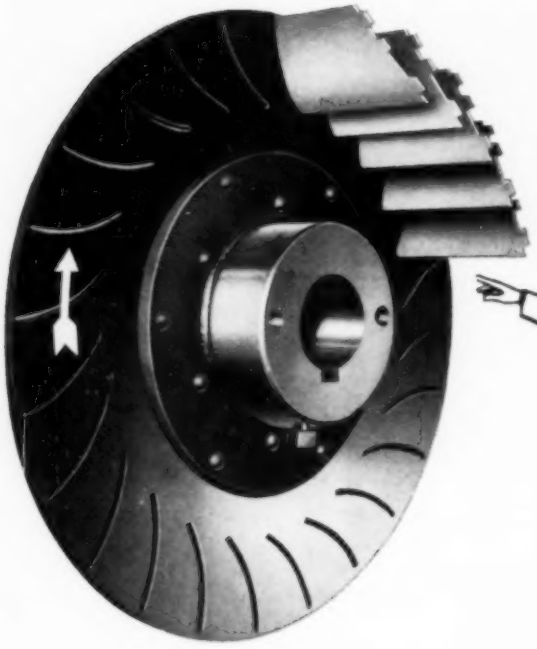


Outdoor Installation on jacket water-cooling units is ideal for Allis-Chalmers motors. Cast-iron frame and conduit box aren't affected by weather.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5183



Something different (and decidedly better) distinguishes this wheel

ONE-PIECE blades extend THROUGH slots in the centerplate — then are welded both front and back on both sides of the centerplate.

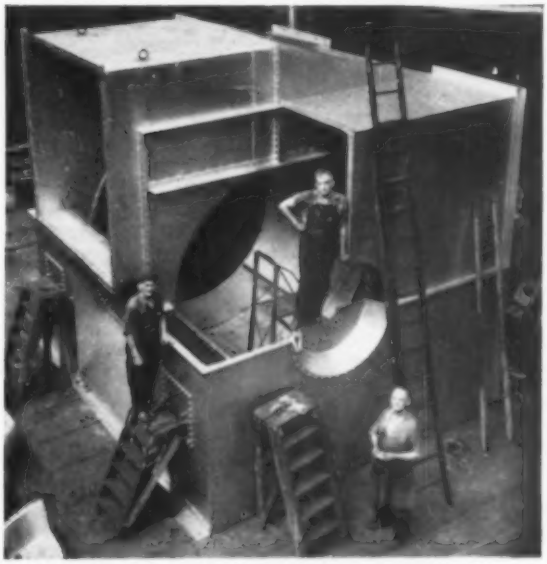
. . . a typical CLARAGE answer to the demands of mechanical draft

Sure, you can perhaps get by with lesser construction. That is, a wheel with separate blades on each side of the centerplate.

But our conviction is: there can be no compromising on the construction of a punishment-taking mechanical draft fan.

That's why, unlike wheels of other makes, the wheel for the Clarage Type RT fan is built as shown above. Clearly, this construction provides EXTRA strength that assures the user longer-lasting, trouble-free service.

Additional advantages of choosing Clarage Type RT equipment are shown in Catalog 901. Write for it today. CLARAGE FAN COMPANY, Kalamazoo, Michigan.



Clarage builds for many of the biggest and most exacting air handling jobs. This Type RT fan was constructed for induced draft service in a Porto Rican sugar refinery.

CLARAGE

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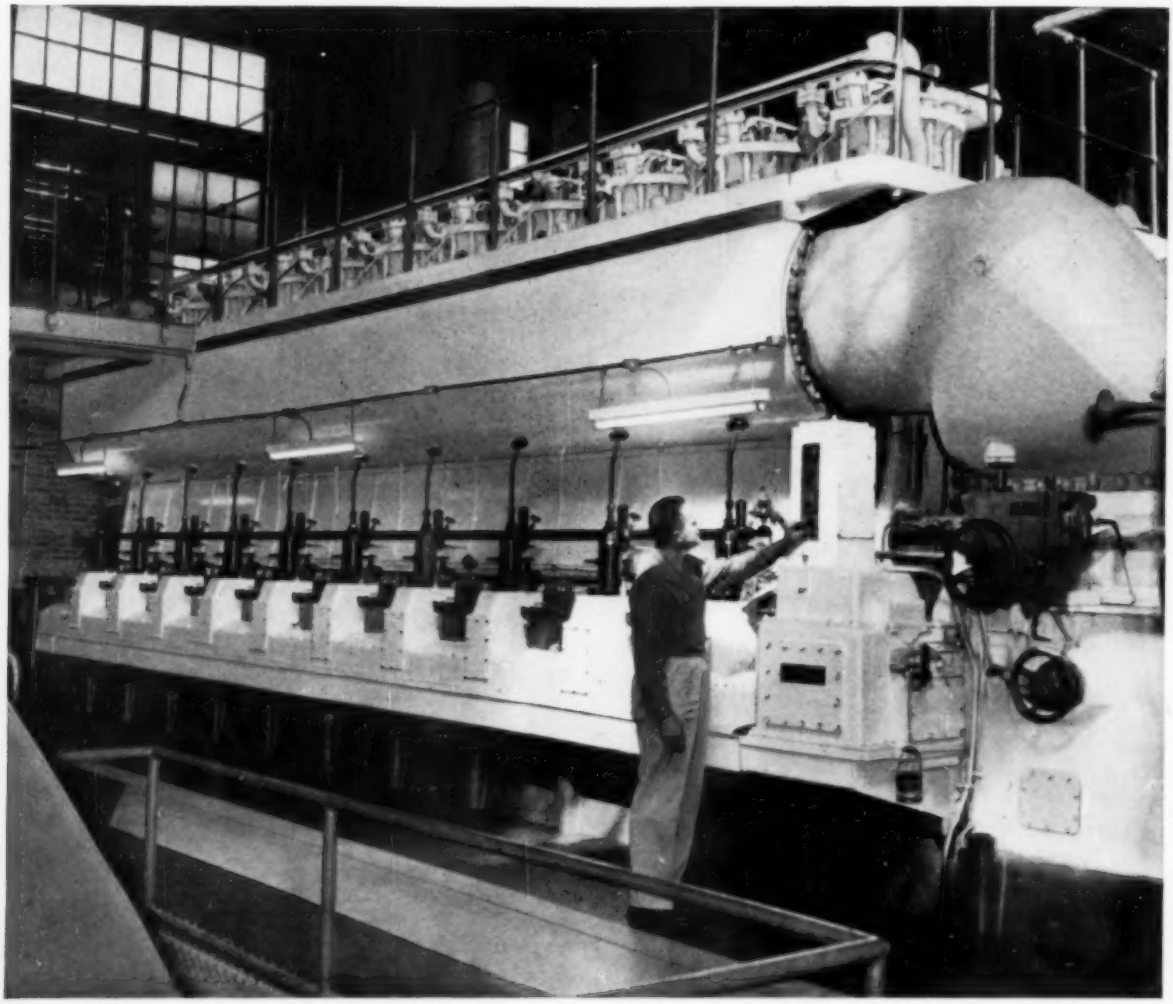

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SOUTHERN POWER AND INDUSTRY

Vol. 74
No. 12

DECEMBER, 1956

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Volume 74 **Number 12**

Facts and Trends

FOR SOUTHERN INDUSTRIAL AND POWER EXECUTIVES

December 1, 1956

◆ PUMP APPLICATION is becoming more and more demanding upon pump suction conditions. Operating temperatures are constantly increasing. Process systems require the operation of pumping equipment under very high vacuums so that the fluid being pumped is very near the vapor point. Chemical fluids with viscous, volatile, and unstable properties make pump selection problems ever more difficult.

Through research, the theories and formulae of the concept of Net Positive Suction Head (NPSH) have evolved to simplify the selection of pumping equipment for difficult applications. But these theories have been made unnecessarily difficult for many involved in the specifying, selecting, and application of pumping equipment to understand.

In this issue, SPI presents the first of three articles which will clarify the basic fundamentals of NPSH. Part 1 defines absolute pressure and vapor pressure, and gives constants and explanations necessary to understand NPSH and recognize its importance. Part 2 (January issue) will discuss cavitation, and Part 3 (February issue) will present calculations of NPSH.

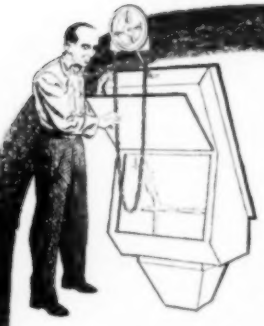
◆ WORLD'S LARGEST internal combustion engine power station is at the Point Comfort Works of Alcoa in Texas. Alcoa recently placed 26 additional Nordberg radial-engine-generator units in service at its massive smelting works. Twenty-two more units have been ordered for delivery in early 1957 to provide power for the seventh pot line.

This new line will add 20,000 tons to the operation's installed capacity of 120,000 tons annually. This production requires the generation of well over 4,000,000 kwh per 24 hours. A total of 220 Nordberg engines with a maximum capacity of over 400,000 hp are now installed. The newly ordered units will raise the capacity to over 470,000 hp.

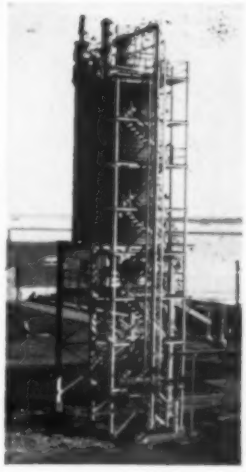
◆ PORTABLE INSULATING OIL FILTERING DEVICE is offering production and maintenance economies at Houston Lighting & Power Company. Installation and maintenance of large power transformers and oil circuit breakers presented larger oil handling problems. Engineers needed a device that would move oil in larger quantities than filter presses and at the same time insure that contaminations due to service and handling have been removed from the oil before restoring it in the unit being inspected.

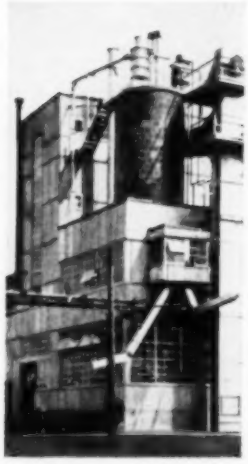
Company engineers are now using the Fram liquid separator filter Space-Saver Unit as the filtering device with a Viking pump driven by a 2 hp motor. Equipment is capable of removing solid contaminants and moisture from the oil and moving it at about 25 gpm. Since this is about 3 times faster than the blotter press filters, HL&P affects a great saving in man-hours per inspection.

The shop assembled unit is mounted on two wheels and the axle is supported by the channel on which the filter and pump are mounted. Unit is easily handled on the ground and portable on a 1/2 ton pickup.



100 ton Ash Silo straddling R.R. track with full stairway to roof. High capacity Ash Conditioner on open platform with discharge to R. cars.





Ash Silo constructed integrally with boiler house. Ash Conditioner mounted inside building. Bifurcated chute allows R.R. car or truck loading.

Ash Silo for truck loading with enclosed room for ash conditioner.

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Manufacturers of National ChipVeyor Systems for the collection, processing, and reclamation of valuable cutting oils and metal chips and borings and Pneumatic Systems for handling dry granular materials.

Facts and trends (*continued from page 4)*

◆ IN CONTINUOUS PROCESS PLANTS the weak links in continuity of operation are frequently the plant services—steam, water, air and electricity. Of these utilities, the electric service is most often singled out as the weakest link in the chain. This is understandable considering the many sources of outage to which the power supply to units is subject—natural phenomena (lightning, winds, etc.); over-voltage conditions and switching surges; mal-operation of relay system; and cable and insulator failures.

In this issue, J. D. Ramsey, Manager of Utilities for Shell Oil Company's Norco, Louisiana refinery, presents some features and problems which are frequently encountered in the design of high quality electric service for processing plants. Semi-technical discussion covers power sources, system development, substations and switchgear, distribution, and details of actual operating experience over the past 2 1/2 years.

Shell engineers have tried not to be completely dominated by what has been done before. As long as basic and proven design principles with reference to safety and reliability are not violated, they have not hesitated to proceed with new ideas.

◆ GLASS HEAT EXCHANGERS—World's largest concentrated system of Pyrex heat exchangers was recently put into operation by The American Thread Company at its Sevier, North Carolina finishing plant. Due to the corrosive nature of the dye waste, no metal exchanger was considered other than one made entirely of stainless steel. This was prohibited from an economy viewpoint.

Heat exchanger design, construction and operating details are featured in this issue. The corrosive dye comes in contact with nothing but glass, Teflon and ceramics which means a minimum of maintenance.

◆ ADEQUATE WIRING is like a magnifying glass—if the current is doubled, then the amount of heat generated is quadrupled. As adequate wiring is accepted, sizes of services and of wiring systems will increase, current will increase, and the possibility of hazard, overheating and fire will increase by the square of the increase in the current.

Chief Engineer of The Thomas & Betts Co. recently likened adequate wiring to a magnifying glass, of"squaring power" which shows the importance of terminals, splices, taps, bushings, entrance caps and other connectors and fittings to a wiring system and its raceway. "An imperfect connection causes local heating, a danger which grows as current is increased due to the requirements of adequate wiring."

When selecting fittings and connectors, among the things a buyer should look for is Underwriters' Laboratories approval, indicated by the familiary "UL" emblem or by inclusion on UL's listing cards.

◆ STEAM AND WATER MIXER—Cold water and steam can be automatically mixed to provide hot water at any desired temperature regardless of pressure changes in supply lines with Powers Regulator Company's new Style D Mixer. Control can be used to obtain hot water where only cold water and steam are available, or to superheat plant hot water for a processing application.

Write the editors for additional information on any of the above items. SOUTHERN POWER & INDUSTRY. 806 Peachtree St., N.E. Atlanta 8, Ga.

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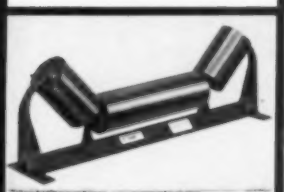
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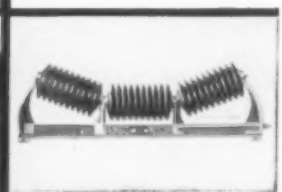
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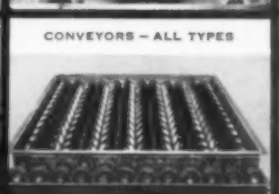
MINES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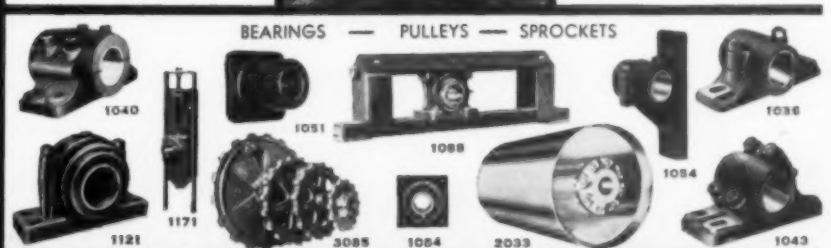
CARBIDE PLANTS

POWER PLANTS

OIL MILLS



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NEWS *for the South and Southwest*

Hathaway—Denver

New product developments will be facilitated, upon the completion early next year, by an ultramodern new research and development plant for the **Hathaway Instrument Division** of the Hamilton Watch Company.

Situated in **Denver**, the new plant will have 45,000 sq feet of floor space and is being built on a ten-and-a-half acre site. Arthur B. Sinkler, Hamilton Watch Company's President, stated that these facilities would include a one-story plant for increased development work and a two-story unit housing offices and laboratories for advanced research.

The Hathaway Division has developed and produces an array of electronic measuring, recording and control instruments. Increased production of present instruments and development of many new types will be possible with the completion.

Lockheed—Georgia

Six top-level executive appointments at Lockheed's Georgia Division have been announced by D. J. Haughton, general manager and vice president of the company.

H. Fletcher Brown, Georgia Division manufacturing manager since 1952, becomes assistant general manager of the Georgia Division, succeeding **A. Carl Kotchian**, who was elected Georgia Division general manager and as a vice president of Lockheed succeeding Haughton.

Ralph J. Osborn, assistant manufacturing manager, will be the new manufacturing manager.

R. A. Mackenzie, production manager, becomes assistant manufacturing manager.

H. Lee Poore, assistant production manager, becomes production manager.

William B. Rieke, director of material, will be the new assistant production manager.

Nicholas Ricciardi, purchasing department manager, is appointed director of material.

Public Utilities Association

William J. Stewart, assistant general manager of the Wheeling Electric Company, Wheeling, W. Va., was elected president of the **Public Utilities Association of the Virginias** at the recent 38th Annual Meeting of the Association at White Sulphur Springs, W. Va. He succeeds **Don B. Potter**, president of Monongahela Power Company, Fairmont, W. Va.

Other newly-elected PUAV officers are **John C. Parrott**, president of the Roanoke Gas Company, Roanoke, Va., who succeeds Mr. Stewart as first vice president, and **Hugh D. Stillman**, division manager, Appalachian Electric Power Company, Huntington, W. Va. who was elected second vice president. **W. F. Keehne**, system office manager, Appalachian Electric Power Company, Roanoke, Va., was re-elected as treasurer and **Arthur T. Ellett**, secretary-treasurer, Roanoke Gas Company, Roanoke, Va., was elected as assistant treasurer. **Robert W. McKinnon**, of Roanoke, Va., was re-elected executive secretary.

Jeffrey—South & Southwest

Three transfers of sales personnel from its home office to southern offices are being announced by the Industrial Division of **The Jeffrey Manufacturing Company**, Columbus, Ohio through Paul Lawall, Manager of District Offices.

William A. Lewis has been assigned to the **Houston** office, 903 City National Bank Building. A Purdue University alumnus, Lewis is a graduate of the Jeffrey Training Program and previously worked in the company's General Engineering Sales Department.

James A. Frazier has joined the **Beckley, W. Va.** office, located at 403-405 City Avenue. He attended West Virginia University and has been with Jeffrey for 10 years. Previous duties were in the Cost, Pricing, and Product Sales Departments at Jeffrey.

Ralph C. Bolton is now working in the **Birmingham** office at 2210 Third Avenue, North. He recently completed the Jeffrey Sales Training Program. He was graduated in 1955 from Mississippi State College, where he played varsity football for four years.

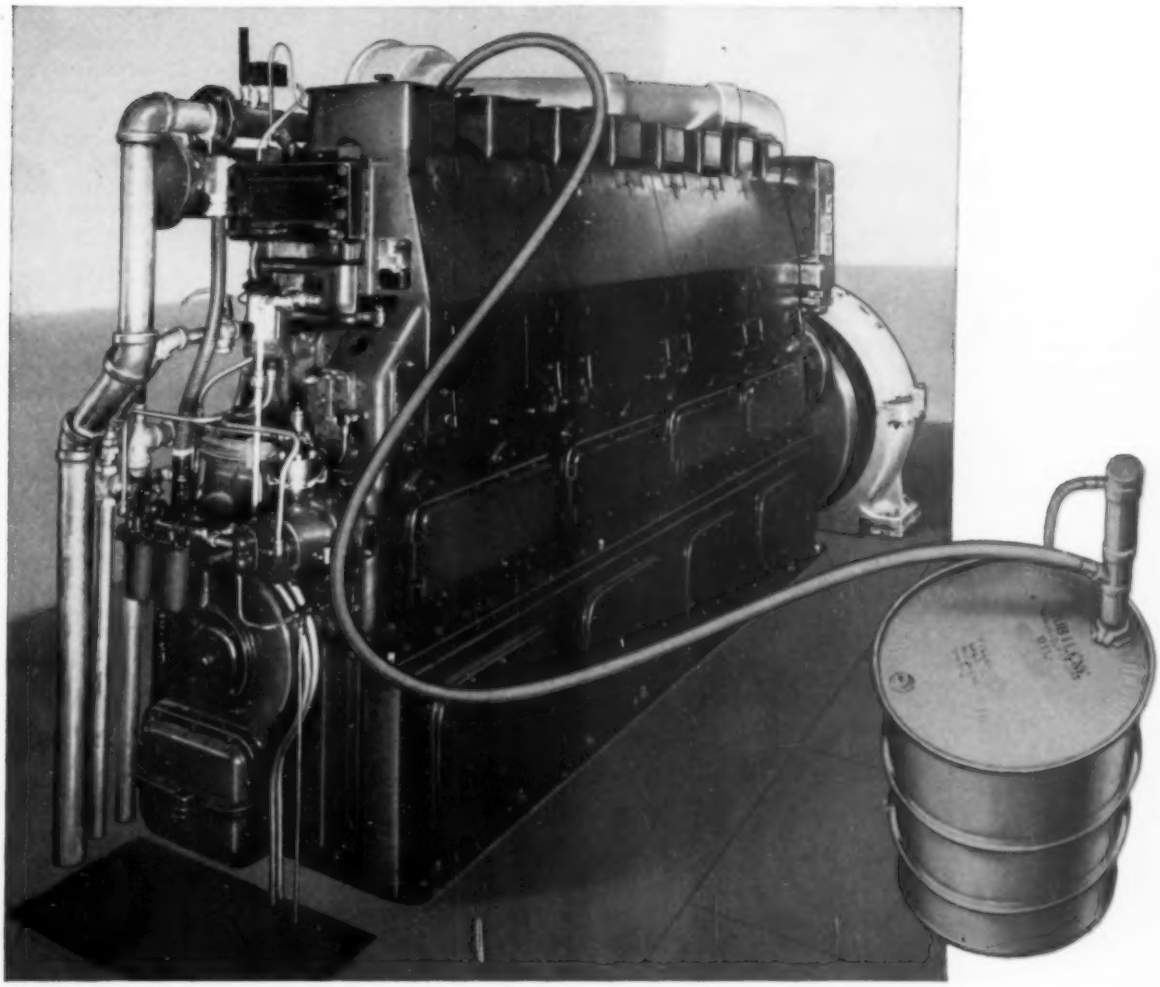
Jeffrey manufactures conveying, processing and mining equipment, transmission machinery and is engaged in contract manufacturing.

Cambar Is Ramset Distrib.

The Cameron & Barkley Co. has been appointed an authorized distributor for the Ramset Fastening System, the most advanced method for setting threaded studs (or nail-like pins) into concrete or steel.

Ramset is a powder-actuated system of fastening which includes three integrated units: a tool, a power charge and a fastener. It is 15 times faster than old-style methods of fastening construction materials to steel or concrete.

Complete stocks of Ramset guns, studs and cartridges will be maintained at the Cambar warehouses in Charleston, South Carolina, Savannah, Georgia, Jacksonville, Orlando, Tampa and Miami, Florida.



Stops Thin-Out!

You can protect your Diesel against wear due to excessive thin-out of the lubricating oil at higher operating temperatures. Switch to Sinclair RUBILENE®, *the high viscosity index oil* proved by over 35 years in a wide variety of Diesel applications. You'll find RUBILENE holds its high film strength and reduces oil consumption . . . gives you better protection of cylinders, pistons, rings and other vital moving parts operating continuously for long periods. Your Diesel logs more full-power hours!

Switch now to RUBILENE. Regardless of the make of your Diesel, there's a member of Sinclair's famous RUBILENE or RUBILENE HD family that meets your needs exactly! Call your local Sinclair Representative or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation!*

SINCLAIR

RUBILENE OILS

Iron Fireman—Mo.

Gurth Baldwin has been named manager of the **Iron Fireman Mfg. Co.'s** sales and service branch in **St. Louis, Mo.** He joined the company in 1947 as assistant service manager of the Cleveland sales and service branch. He later became installation manager. Last year, he was appointed Cleveland branch manager.

Baldwin served, in World War II, in the armed services. He is married and has two small children.

In his new position, Baldwin will be responsible for sales and service of all types of Iron Fireman equipment, including gas-fired, oil-fired, and coal-fired units, and the Selec-Temp zone heating system for residential and commercial installations.

Harold Ford & Ronald W. Gee

L. B. Foster Co.—Southeast

Paul A. Duke, district general manager in the Atlanta office of **L. B. Foster Company,** has announced two personnel appointments and transfer of the company's Southeastern headquarters to larger offices. Both developments are the result of growing demands for Foster's steel pipe, sheet piling and railroad trackage materials stemming from continuing industrial expansion in the area.

Harold Ford has been appointed district sales manager and **Ronald W. Gee** has been named office supervisor. Both Mr. Ford and Mr. Gee have been with Foster since the Atlanta office was opened in May, 1955.

The firm's new offices occupy 2,500 sq ft in a recently comp'eted building at 795 Peachtree St. One reason for the move is anticipation of increased sales resulting from the recent establishment of a 17-acre storage and warehouse site. The new storage facilities will permit stocking larger quantities of pipe, piling and other Foster products and speed up deliveries to customers in Southeastern states.

FUTURE EVENTS
of Engineering Interest

Jan. 28-31: Plant Maintenance & Engineering Show, Public Auditorium, **Cleveland, Ohio.** 400 companies to participate in the show, displaying 5,000 pieces of equipment and accessory products in 278 categories. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Feb. 3-5: 26th Annual Mid-Winter Conference, Public Utility Buyers' Group, **National Association of Purchasing Agents,** The Brown Hotel, **Louisville, Ky.** L. Glen Wiseley, Chairman, Public Utility Buyers' Group, National Association of Purchasing Agents, Michigan Consolidated Gas Co., 415 Clifford St., Detroit 26, Mich.

Feb. 25-Mar. 1: 13th International Heating & Air-Conditioning Exposition, **American Society of Heating & Air-Conditioning Engineers,** International Amphitheatre, **Chicago, Ill.** E. K. Stevens, President, International Exposition Co., 480 Lexington Ave., New York 17, N. Y.

Mar. 3-5: Southern Safety Conference & Exposition. John Marshall Hotel, **Richmond, Va.** 14 Southern states provide exhibit of safety items and will give 14 sectional programs on specific safety subjects. W. L. Groth, Executive Director, Box 8927, Richmond 25, Va.

Howard Johnson Exec. V.P. of Atlantic Steel Co.

Howard B. Johnson has been named Executive Vice President of the **Atlantic Steel Company,** Atlanta, Georgia—one of the country's few wholly independent steel producers. The announcement was made recently by company President **Robert S. Lynch.**

Mr. Johnson had held the position of Vice President in Charge of Sales and Finance since 1949, and a member of the Board of Directors since 1950.

Born in Tallapoosa, Georgia, Mr. Johnson received his early education in the local schools. At the age of 16, he came to Atlanta to enroll in the Georgia Institute of Technology. He graduated from there in 1934.

While attending college, he also went to work for the Atlanta Gas Light Company, in the accounting and credit department. In 1933, he resigned as Assistant Credit Manager of Atlanta Gas Light Company and joined Atlantic Steel, starting in the Accounting Department. Advancements followed to cost accountant, chief schedule engineer, and order department manager. He was named Assistant Secretary in 1945, and Vice President, Finance and Accounting the following year.

Sparks Withington—Mo.

Robert D. Flori has been elected president of the new combination of the **Flori Pipe Company** of St. Louis

and **The Houston Pipe & Steel Company** of Houston. This announcement was made by John J. Smith, President, the Sparks Withington Company, Jackson, Michigan, parent company of the new combination. The two companies will constitute the pipe fabricating operation of Sparks Withington following purchase by the latter company of 100% of the stock of Houston Pipe & Steel. The Flori Pipe Company has been a subsidiary of Sparks Withington since last February. The new combination is now one of the largest pipe fabricators in the industry.

Mr. Flori, chief executive officer of Flori Pipe for the past six years, will make St. Louis his headquarters from which he will coordinate general administration of the new organization. All key personnel of Houston Pipe & Steel are remaining, except J. A. Sims, former owner, who is retiring to other interests. R. W. Reierson is now Vice-President and General Manager in charge of operations in the Houston area. Sales activity will be joint with former sales personnel of each company now representing the combined organization, under the direction of Paul E. Kiebler, vice president.

(*Continued on Page* 87)

Plant, Research Laboratories and World Headquarters

BETTER FASTER

Low Temperature EUTECTIC WELDING ALLOYS

STRONGER WELDS

EUTECTIC Welding News

PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.

EUTECROD 144 REMOVES CAST IRON WELD HEADACHES

Eutectic's research and consistent efforts to eliminate cast iron weld "headaches" have produced two completely new welding rods, EutecRod 144FC Super and EutecRod 144 Super, which promise to make cast iron repair routine.

Repair of cast iron has always required considerable welding skill. The weldor often had to use a scraper to work out sand, gas pockets, and porosities. Weldors found that conventional welding rods did not produce deposits of sufficient density to overcome these defects.

In the past, Eutectic's research eased some of these difficulties. Now EutecRod 144FC Super and EutecRod 144 Super dispense with the scraper and permit even inexperienced weldors to handle diverse cast iron repairs in all positions. With EutecRod 144, the weldor can easily control the molten filler metal. These new rods produce extremely dense weld deposits which are easily machinable and have good color match. Blow holes, sand inclusions, and gas pockets are prevented. EutecRod 144 does not require fusion of the base metal and is applied at the lowest possible base metal heat.

These rods are ideal for repair of breaks in castings, building up missing sections, and repairing machining errors. They allow the welding of unusually thin sections. Ultimate tensile strength is 50,000 psi.

WORLD-WIDE EUTECTIC WELDING INSTITUTE CLASSES

Eutectic's growing world-wide program of service to industry continues with the introduction of Eutectic Welding Institute classes in Hawaii, New Zealand, and Australia. The classes, which explain the newest techniques and applications of "Low Heat Input" welding, drew praise from weldors and leaders of industry.

Weld Savings Application Reports were particularly well-received by such industries as the government-owned airlines in Australia. Pioneered by Eutectic and prepared by Eutectic welding specialists, this report recommends improved welding practices for lowering production and maintenance costs. Free reprints of these reports for various industries (TIS 2605) are available from Eutectic District Engineers or from Eutectic's Technical Information Service.

EUTEC-CHAMFERTRODE CUTS LABOR COSTS BY OVER 85%

Removal of excess and old or defective weld metal is made easy with Eutec-ChamferTrode. An owner of a fabricating company successfully used Eutec-ChamferTrode to dismantle and re-assemble a large order of scaffolding forms. With conventional methods, half the forms would have been lost. With Eutec-ChamferTrode, the forms were cut apart with minimum effort, no loss of forms, and no clean up or dressing before re-welding. Labor costs were cut by over 85%.

Eutec-ChamferTrode for ferrous or non-ferrous metals has a special exothermic coating. It concentrates the force of the arc right at the point of application, yielding a highly efficient metal removing tool. Finishing is rarely necessary; an ideal surface is left for further operations.

NINE MONTH WORK STOPPAGE PREVENTED

Use of EutecTrode 680 AC-DC recently saved two Utah coal mines $3,400 on replacement parts. A 12 foot diameter high test nickel iron spurring gear on the company's only dryer had 180 worn down teeth. Replacement would have meant a nine month complete work stoppage.

Repairs were made without any "downtime" with EutecTrode 680 AC-DC. In rebuilding the worn teeth to original size, the weldor ran short beads, skipping around and keeping the casting cool enough to touch at all times. No machining required.

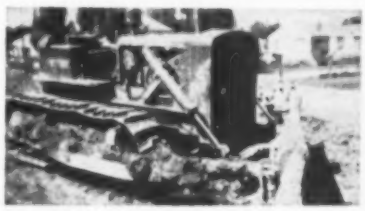
EutecTrode 680 AC-DC is an all purpose, corrosion resistant electrode that permits deposits free from porosities, spatter and undercutting. Welds are deposited at highest possible speeds with least amount of base metal heat, using lowest possible amperage. Ulitmate tensile strength is up to 120,000 psi.

"EUTECTIC'S" DR. BLANC SPEAKS ON BRAZING

Dr. G. M. A. Blanc, of Eutectic's European research affiliate, recently spoke on production brazing before the International Welding Society's 1956 meeting in Madrid.

Dr. Blanc demonstrated that the total cost of an assembly is lowered by using a high quality filler metal, despite its higher unit price. He established that brazing is the best solution for diverse manufacturing problems, fulfilling all technical and cost requirements. Write for a free copy of "Productivity by Brazing," (TIS 2635).

OPERATING COSTS CUT FROM $1.10 TO 33¢ PER HOUR



A highway construction company found the protective pads attached to their tractor grousers wearing down in less than 225 operating hours. As the best means of reducing this costly wear, EutecTrode 10 was selected. An extremely easy to apply "Frigid Arc" coated electrode, it resists severe abrasive wear and gives a lasting hardness with great corrosion resistance. After using EutecTrode 10, the company found their tractor pads in excellent condition after 530 operating hours and estimated they would receive at least 400 more service hours. Operating costs were reduced from $1.10 to 33 cents per hour.

EUTECTRODE 1851 CUTS "DOWNTIME" BY ONE-THIRD

Continuous failure to prevent cracking of castings with conventional welding materials led an eastern railroad to experiment with EutecTrode 1851.

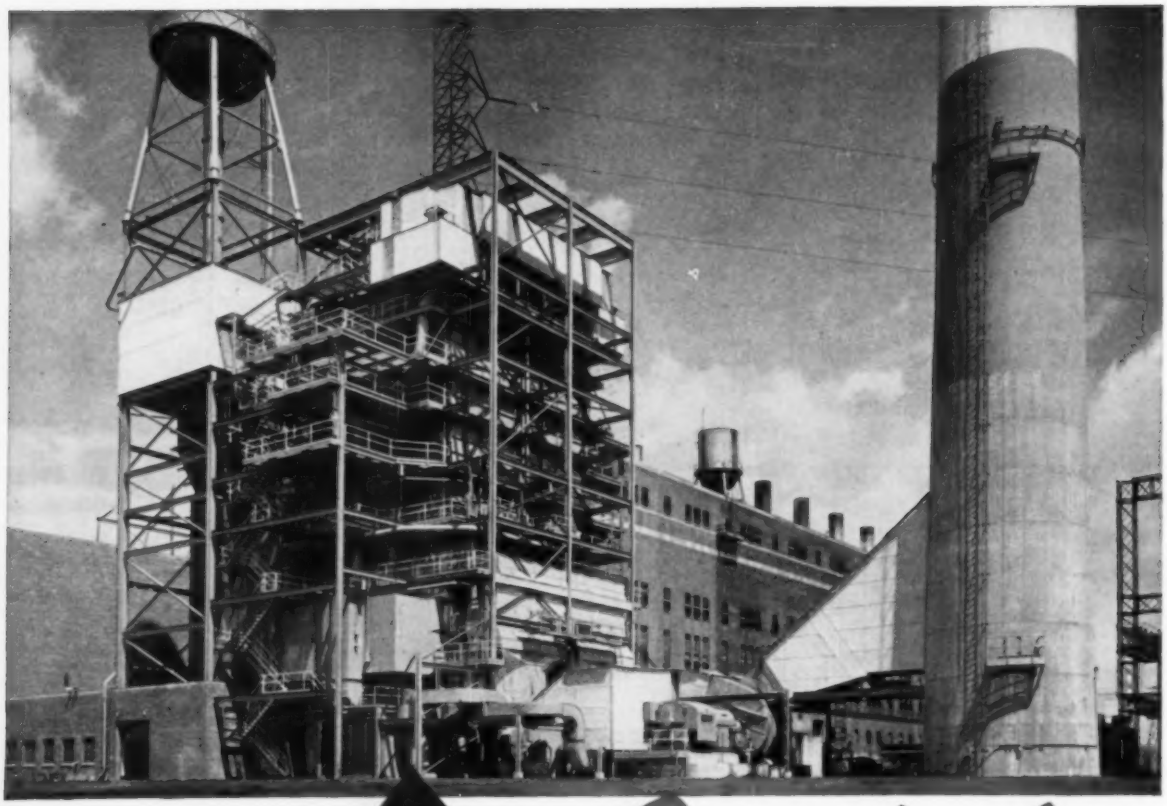
Repeatedly, EutecTrode 1851 has proved its great resistance to cracking in welding steel, iron, copper alloys, stainless steel, nickel and nickel alloys. Its rapid deposition permits high speed welding and produces homogenous welds. It is ideal for dissimilar metals and dissimilar thicknesses.

Use of EutecTrode 1851 by the railroad produced a non-porous, high strength deposit. No cracking has occurred.

EUTECTIC WELDING ALLOYS AT POWER SHOW

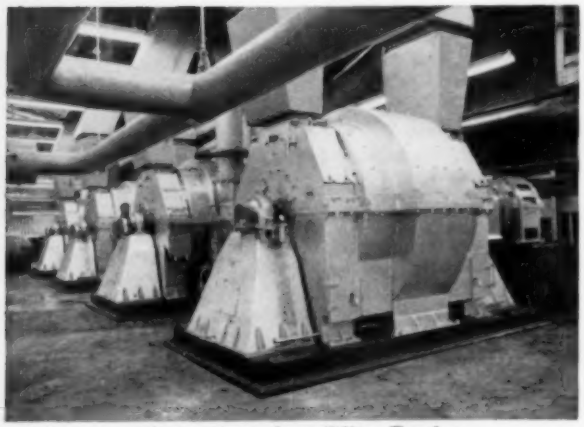
Visit Eutectic's Booth 214 at the Power Show, New York Coliseum, November 26-30.

"EUTECTIC" WELDING HEADLINES • TIME-MONEY-MACHINERY SAVERS

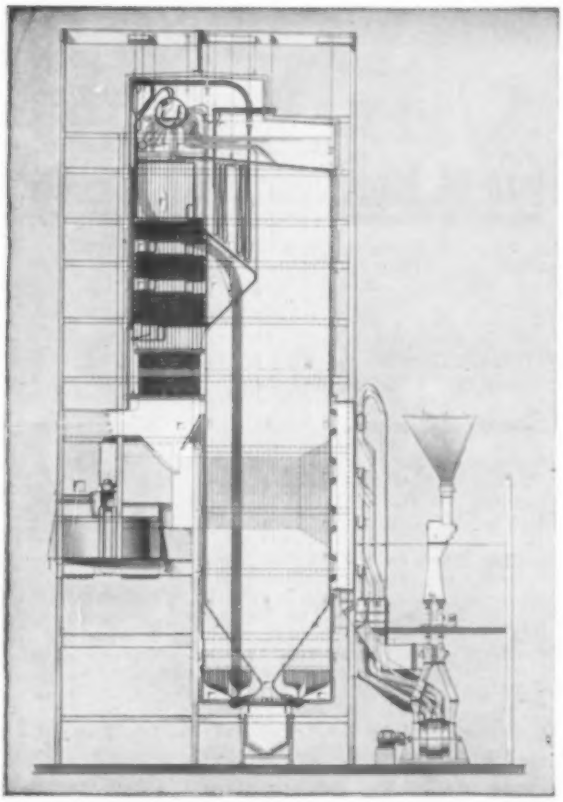


On the line.

Actual unretouched burner elevation view inside Picway's Riley Furnace after 80,000 tons of low ash fusion temperature coals had been fired. Low incidence of slag formation around burners is due to the Riley design of water-cooled burner throats.



Eight Riley Coal Feeders at Picway Station accurately meter the coal to four Riley Duplex Pulverizers. Riley Pulverizers are distinguished for their quiet, smooth, vibrationless operation, their ability to respond to rapid load swings, and their ability to handle wet coals. Tungsten Carbide faced pulverizing elements assure sustained high fineness and low maintenance.



THE new 100,000 kilowatt electric generating unit recently placed in service at Columbus and Southern Ohio Electric Company's Picway Generating Station located a few miles south of Columbus, Ohio, is supplied by a 900,000 lb/hr. Riley Unit that is designed to operate as a swing load unit using Ohio Strip Mine Coals.

The unit features an ample furnace and is fired by four Riley Duplex Pulverizers and twelve Riley Flare Type Coal Burners. This combination of Riley equipment is ideally suited to meet the wide swings in load of the new generating unit.

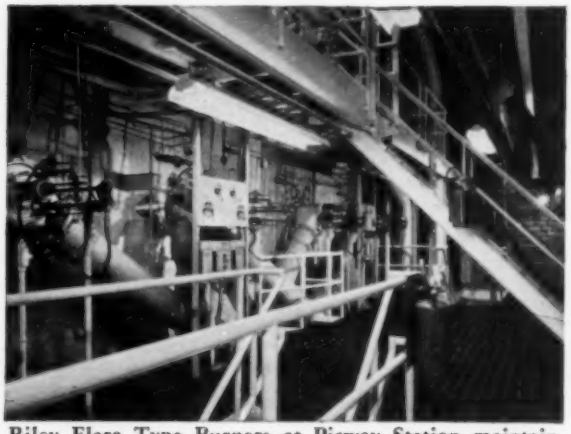
Picway's New Riley Unit

This new generating unit of Picway Station increases the total installed generating capacity of Columbus and Southern Ohio Electric Company to 560,000 kilowatts, representing an increase of 165% during the past 10 years.

Engineering Data

Maximum steam capacity —	900,000 lbs/hr.
Design Pressure	1500 psig
Steam Temperature	950 F

Commonwealth Associates, Inc., Engineers



Riley Flare Type Burners at Picway Station maintain continuous, stable ignition at low loads. A common air duct supplies secondary air. Direction and rotation of burner flames is by remote control.

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

RILEY

Stoker Corporation

WORCESTER, MASSACHUSETTS

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-INDEX OF HELPFUL BOOKLETS, BULLETINS, REFERENCE LITERATURE-

STEAM TURBINES . . . FURNACES BOILERS, STOKERS, BURNERS

25—Packaged Boilers — New bulletin PSG-2 shows construction details and table of capacities, dimensions and weights for nine sizes of units. — HENRY VOGT MACHINE CO.

44—Fan Stacks — I-D fan, breeching and stack integrated in a single unit described in Bulletin 1-PCD-1. Straight through breeching assures high, predeterminable efficiency. Structural steel requirements reduced and installation simplified.—PRAT-DANIEL CORPORATION.

51—Steam Generators — Catalog 811 describes 18 sizes from 20 to 600 Bhp for fully automatic operation burning oil, or gas, or both; pressures to 250 psi; 80% thermal efficiency guaranteed. — SUPERIOR COMBUSTION INDUSTRIES INC.

56—Water Tube Boilers — Booklet — Describes details of stoker — oil or gas or combination gas/oil, 10 to 350 hp to 250 psi; designed for easy conversion to any fuel. — QUEEN CITY ENGINEERING CO.

61—Ash Removal — Bulletin S-56 shows how costs can be reduced with a National pneumatic steam-operated or motor-driven air exhaust type system. High operating efficiency based on tons of ash handled per pound of steam used.—NATIONAL CONVEYORS COMPANY, INC.

81—Fly Ash and Dust Recovery — Engineering Booklet — Gives data and illustrations on the multiclone mechanical dust collector, showing basic principles and typical application for dust and fly ash recovery. — WESTERN PRECIPITATION CORP.

87—Steam Turbines—Single Stage—Bulletin 500 describes features and characteristics of company's type DH steam turbines in horizontal and vertical models. — DEAN HILL PUMP COMPANY, INC.

88—Industrial Burners — General Bulletin 751, 16 pages — Describes and illustrates industrial oil burners, gas burners, combination gas and oil burners for boilers, dryers, stills, retorts, kilns, etc., and fuel oil pumping and heating units which go therewith. — NATIONAL AIROIL BURNER CO.

FANS—PUMPS—COMPRESSORS HEATERS—HEAT EXCHANGERS

106—Compressor Valves — Bulletin illustrates Voss valves, used to replace original valves in compressors of any size, type, and make. Applications, advantages and efficiency under severe operating conditions outlined.—J. H. H. VOSS CO., INC.

108—Active Air—Catalog 2046 shows how to put active air to work in buildings and shops. Direct drive exhaust fans, air circulators, and ceiling fans. — EMERSON - ELECTRIC.

110—Deaerator — Publ. 4651 describes design that eliminates tubular vent condensers without impairing efficient purging of non-condensible gases. Unit handles wide range of operating conditions.—COCHRANE CORPORATION.

113—Industrial Service Pumps — 16 page Bulletin B-505 describes standard, heavy-duty and special service types offering vertical versatility in pumping liquids from short settings. Capacities: 30 gpm to 40,000 gpm; heads up to 1000 ft. Electric drive up to 2500 hp. — PEERLESS PUMP DIVISION.

123—Slurry Pump — Catalog describes the new SP-90 slurry pump which permits proportion of slurries in the mix tank to remain constant, with pumping rates variable from maximum to 1/5 of maximum.—MANZEL.

126—Centrifugal Pumps — Bulletin 7248A covers new DMV-DHV single-stage line for general hydraulic service; double mechanical shaft seals eliminate stuffing box maintenance; sizes from 3 to 6 in. with heads to 350 ft & capacities from 250 to 2400 gpm. — INGERSOLL-RAND.

132—High Temperature Air Handling — Bulletin 702 describes Type XL Fans equipped with air cooled bearings for temperatures up to 750 F. — CLARAGE FAN COMPANY.

152—Stainless Steel Pump — Bulletin 725.4 describes pump for economical handling of hot, corrosive or abrasive liquids; 9 sizes with capacities up to 720 gpm; heads to 200 ft. — GOULDS PUMPS INC.

170—Heat Exchangers — Bulletins 120 & 124 describe Aero units which cool liquids & gases by evaporative cooling with atmospheric air, removing heat at rate of input, and precisely controlling temperature. Solves problems of water availability, quality or temperature. — NIAGARA BLOWER CO.

INSTRUMENTS—METERS CONTROLS—REGULATORS

212—Automatic Temperature Control —Data sheets describe versatile automatic indicating temperature control offering many sequence combinations—step-heating, heating and cooling, wide limit control, or temperature control plus operation of signal devices.—SARCO COMPANY, INC.

218—Level Alarms — Bulletin D2 shows how you can operate alarms, fuel cut-out, start and stop pumps safely and accurately with Level-arms. Wide variation of control combinations.—THE RELIANCE GAUGE COLUMN COMPANY.

Note Your New Reader SERVICE on Advertisements

222—Pressure Regulators — Catalog 76—Gives complete detailed information covering applications, operation and specifications of Reducing Valves, Pump Pressure Regulators and Back-Pressure Regulators. Included is a simple, practical method for selecting size of regulators.—MASON-NEILAN DIV.

242—Control Valves—Catalog 1500-B—Illustrated—Describes complete line of Domotor, solenoid-operated and handwheel single seat control valves for handling difficult fluids under extremes of temperature and pressure. Offers full, unrestricted flow, positive plug and seat alignment and directional flow flexibility. — THE ANNIN COMPANY.

244—Desuperheater — Bulletin 1024 shows how steam assist desuperheater delivers more accurate control of final steam temperature for process work or auxiliaries. Close control, even at 10 degrees above saturated temperature. Minimum maintenance and long service life. —COPES - VULCAN DIVISION, BLAW-KNOX COMPANY.

251—Temperature Regulators—Complete line of regulators for liquids and gases detailed in Bulletin T-101. Available in single or double-seated construction; direct or reverse acting for cooling. Reduce piping costs and assure control of temperature at any pre-determined pressure.—FOSTER ENGINEERING COMPANY.

253—Combustion Efficiency — Specs E65-1 & E12-5 describe oxygen-combustibles analyzer-recorder which provides continuous 2 in 1 check of combustion efficiency by recording both oxygen and combustibles in flue gas. — BAILEY METER COMPANY.

267—Remote Liquid Level Indicator —How clear, brilliant readings from any angle are possible with this unit is explained in Bulletin WG-1824. Pointer is always visible, even at extreme high and low water levels. Of manometric type with automatic temperature compensation. — YARNALL-WARING COMPANY.

280—Valve Manifolds — Bulletin 56-1 explains how the new Equa-Safe manifolds stop mercury blowing and damage to differential bellows and diaphragms. Give excellent protection to differential pressure type instruments. Can be completely dismantled without breaking any pipe connections and inlet seat can be dressed up in place. — REPUBLIC FLOW METERS CO.

297—Remote Signal Alarms — Bulletin WG-1824 describes how lights on horns, operated by indicator control unit give instant warning of any serious deviation from normal boiler water level. — YARNALL-WARING COMPANY.

PLANT EQUIPMENT—WELDING TOOLS—PROCESS SPECIALTIES

300—Cast Iron Welding—Data sheets describe the new Xyron 2-25 strontium-aluminum bearing electrode for crack-free welding of gray and ductile cast iron, including Meehanite, Ni-Resist, and for joining cast iron to steel. — EUTECTIC WELDING ALLOYS CORP.

303—Trash Burners — Bulletin 52S describes a simple, cost-saving disposal method. Portable units available in 200, 300 and 500 lb/hr capacity. Stationary units from 400 to 5000 lb/hr. Peak combustion; no stoking; no burning embers or hot ashes can fall on floor. — BRULE INCINERATORS.

304—Backing Rings — Bulletin 56-2 describes rings designed for fast economical fit-up in piping, tubing, fittings and valves. Shows how rings

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assure uniform complete-penetration welds and ease of handling in both shop and field. Carbon steel, wrought iron, chrome alloys, stainless, aluminum and copper.—ROBVON BACKING RING COMPANY.

336—Retaining Walls—Catalog RW 3555 shows how bin-type walls stabilize slopes and gain valuable ground for buildings, parking areas; all-metal cellular construction; all-bolted assembly means small crews can do the job.—ARMCO DRAINAGE & METAL PRODUCTS, INC.

340—Infra-Radiant Heater — Bulletin describes Panelbloc heaters for heating where natural gas, manufactured or LP is available. Economically installed units need no electrical connection, no fans, motors or moving parts; automatic noise-free operation. — THERMOBLOC DIV., PRAT-DANIEL CORP.

384—Floor Grating — Catalog No. AT254 — Describes company's free planning and checking service for completely custom fabricated floor grating installations.—BORDEN METAL PRODUCTS CO.

PIPING, VALVES, FITTINGS STEAM SPECIALTIES, TRAPS

400—Continuous Blow-Off Valves—Bulletin—Describes the Uniblow complete blow-off unit, with continuous blow-off valve, sediment chamber, clean-out valve, by-pass line. This unit features stainless steel rotary disc valves which offer 15 calibrated orifices to provide any rate of flow - saving on fuel, and giving continuous good service, without moving parts to wear out or leak. — THE UNIBLOW VALVE COMPANY.

402—Forged Steel Valves—32 page supplement of Catalog F-9 covers new general purpose gate, globe and angle valves for 150-800 lb service. Featuring hard faced seating surfaces.—HENRY VOGT MACHINE CO.

405—Air Line Filters — Bulletin 200 shows how simply installed and maintained Staynew pipe line filters keep air-operated equipment free from pipe scale, dust, dirt, and condensates. Filter compressed air under all pressures and temperatures. — DOLLINGER CORPORATION.

409—Lubricated Plug Valves—Catalog PV-4 covers operational features. Quarter-turn to open or close; lubricant grooves provide positive seal when valve is closed; when open, seating surfaces not exposed. —THE WM. POWELL COMPANY.

429—Expansion Joints—Bulletin EJ-1914 describes Gun-Pakt slip-type joints which give long life—no fatigue failures; packing may be added as necessary, under full steam pressure right on the job—no unpacking, no shutdowns.—YARNALL-WARING COMPANY.

430—Check Valve — Catalog 30A highlights the "tilting disc" check valve for handling fluids or gases under wide range of pressures. —THE CHAPMAN VALVE MFG. CO.

434—Relief Valves—Auxiliary valve for generating plants with pressures to 2500 psi and temperatures to 1100 F described in Bulletin 720. Automatic, electrically actuated valve can be accurately set for a differential of 1% or less between opening and closing pressures. Available in 2½", 4", 10" and 14".—MANNING, MAXWELL & MOORE, INC.

439—Self-Cleaning Strainers—Bulletin 5308 describes units to protect all regulating equipment from dirt and foreign matter; liquid, gas, oil and steam services; sizes ⅛" to 10" inclusive; primary service ratings to 2500 psi. — LESLIE CO.

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443—PVC Fittings & Flanges—Corrosion resistant polyvinyl chloride pipe fittings & flanges covered in 12 p catalog, featuring characteristics, advantages, limitations, operating pressures, temperatures, field tests, etc.—GRINNELL COMPANY, INC.

451—Air Relief Traps — Bulletin No. 2062 — Describes application of ball float traps for venting air from hot water heating systems, water service lines, etc. Hook-up drawings, prices included. — ARMSTRONG MACHINE WORKS.

461—Reducing Valves — Data sheets describe Type CV-D (diaphragm) and Type CV-P (piston) reducing valves for application at unlimited pressures for pipe sizes up to 16". Either direct or reverse action; high rangeability. — COPES - VULCAN DIVISION, BLAW - KNOX COMPANY.

MAINTENANCE PACKING GASKETS, LUBRICATION

503—Plastic Repair Compound — Folder tells how Celastic & BBX can be used to make permanent repairs to duct work, fan housings, to waterproof cracked and leaking concrete, cover exterior insulation—1001 uses as general repair item in any plant. — WILSON AND MANKIN.

508—Spray Lubricant — Data sheet describes the Marle open gear spray lubricant in Aerisol cans for use on open gears, cams, monorails, guides, chains, sprockets, etc. Economical, heavy duty and easy-to-use. —ROTHLAN CORP.

512—Lubricator Vacuum Type Pumping Unit—If your plant is experiencing difficulty with visibility and excessive maintenance on lubricator sight glasses, the new 82 vacuum pumping unit will offer lower costs. Form 1263 gives principle of operation and advantages—MANZEL.

564—Anti-Corrosive Paints — Bulletin, "The Application of Subox and Subalox Paints" — Gives the story of a complete paint system for weather, moisture and alkali protection, with details as to application.—SUBOX, INC.

ENGINES, DRIVES POWER TRANSMISSION MATERIALS HANDLING

601—Fluid Drive — Bul. 9819 describes features of improved Type T Gyrol Fluid Drive for general industrial applications. Applications and advantages noted; rating charts give hp ranges for various engine and electric motor drive speeds. — AMERICAN BLOWER CORPORATION.

602—Tramrail Systems — 12 page Booklet 2008 covers principal components used in tramrail systems, stresses developed in tracks, and track peening and its solution. Gives case study illustrations.—CLEVELAND TRAMRAIL DIV.

605—Coupling Selection Chart—22" x 17" chart greatly reduces the time necessary to select a flexible coupling. Big time saver to help you choose the right coupling for your job.—MORSE CHAIN COMPANY.

606—Power-Rotated Jib Crane—Bulletin describes all-electric 360° revolving jib cranes in 6, 7½, 10 and 15 ton capacities which provide power handling for 1936 sq ft of floor space. Design permits fraction-of-an-inch control.—R. G. LETOURNEAU, INC.

608—Conveyor Belt Repairs — Bulletin R-700 and Folder R-4 describe the "Rema" method of making vulcanized repairs without heat. Holes, gouges, rips and tears can be repaired on the job. Curing time delay is eliminated. Belts can be put into service immediately after repair is made.—FLEXIBLE STEEL LACING COMPANY.

610—Flexible Couplings — All metal couplings described in Catalog 51A have no wearing parts; offer freedom from backlash, torsional regidity; free end float; smooth continuous drive; and visual inspection in operation. — THOMAS FLEXIBLE COUPLING CO.

613—Monorail Applications — Bulletin C-1 — "Handling Problems Solved" — gives hundreds of illustrations of monorail applications to handling problems in various industries. Equipment advantages also illustrated. — AMERICAN MONORAIL CO.

614—Vertical Transportation — Elevator Catalog — Describes and illustrates details of passenger and freight elevators, escalators, dumbwaiters, and modernization and maintenance equipment for use in industrial, utility and service plants. —OTIS ELEVATOR CO.

627—Hand Trucks—Bulletin T-I describes full line of steel framed platform and two wheel hand trucks; specifications and applications.—THE FAIRBANKS COMPANY.

WATER TREATMENT, HEATING VENTILATING, AIR CONDITIONING REFRIGERATION, DUST & FUME CONTROL

701—Exhausting Corrosive Fumes—Bulletin 702-A shows how corrosive fumes can be exhausted with rubber, lead lined or specially coated fans.—CLARAGE FAN CO.

702—Water Conditioning — Bulletin 611A, 20 pages—Gives comprehensive data on methods of conditioning water for boiler, process and general use, featuring zeolite water softeners of "double-check" design. Data on filters, purifiers, zeolites, ion-exchange resins, de-gasitors. — ELGIN SOFTENER CORP.

710—Scale Remover—Bulletin shows how Anco Scale Remover quickly eliminates scale in boilers, water lines, refrigeration and air conditioning systems.—ANDERSON CHEMICAL COMPANY.

715—Amine Treatment — Return line corrosion is a critical problem in maintaining economical, efficient power plant operation. Bulletin CP-100 shows how amine treatment is an easy, effective and economical way to eliminate pipe corrosion problems. — THE BIRD ARCHER COMPANY.

725—Cooling Tower — Bulletin CT-56-1 gives construction and operational details of new induced draft cooling tower. — FOSTER WHEELER CORPORATION.

731—Film Type Exchangers—Bulletin HE-7 describes typical installations. Units can be cleaned while in operation. Serve as jacket water coolers, feedwater heaters, sulphuric acid coolers, etc., and can be designed to cool or heat any liquid and to condense or evaporate any fluid. — HENRY VOGT MACHINE CO.

757—Demineralization — Reprint T-140, 24 p, discusses advantages and disadvantages of this process for today's power plants. Developments, trends, applications, case studies, flow sheets and performance curves. —GRAVER WATER CONDITIONING CO.

764—Cooling Equipment — Bulletin 80-D describes company's complete line of commercial and industrial equipment — operating principles, design features, etc.—FRICK CO.

ELECTRICAL

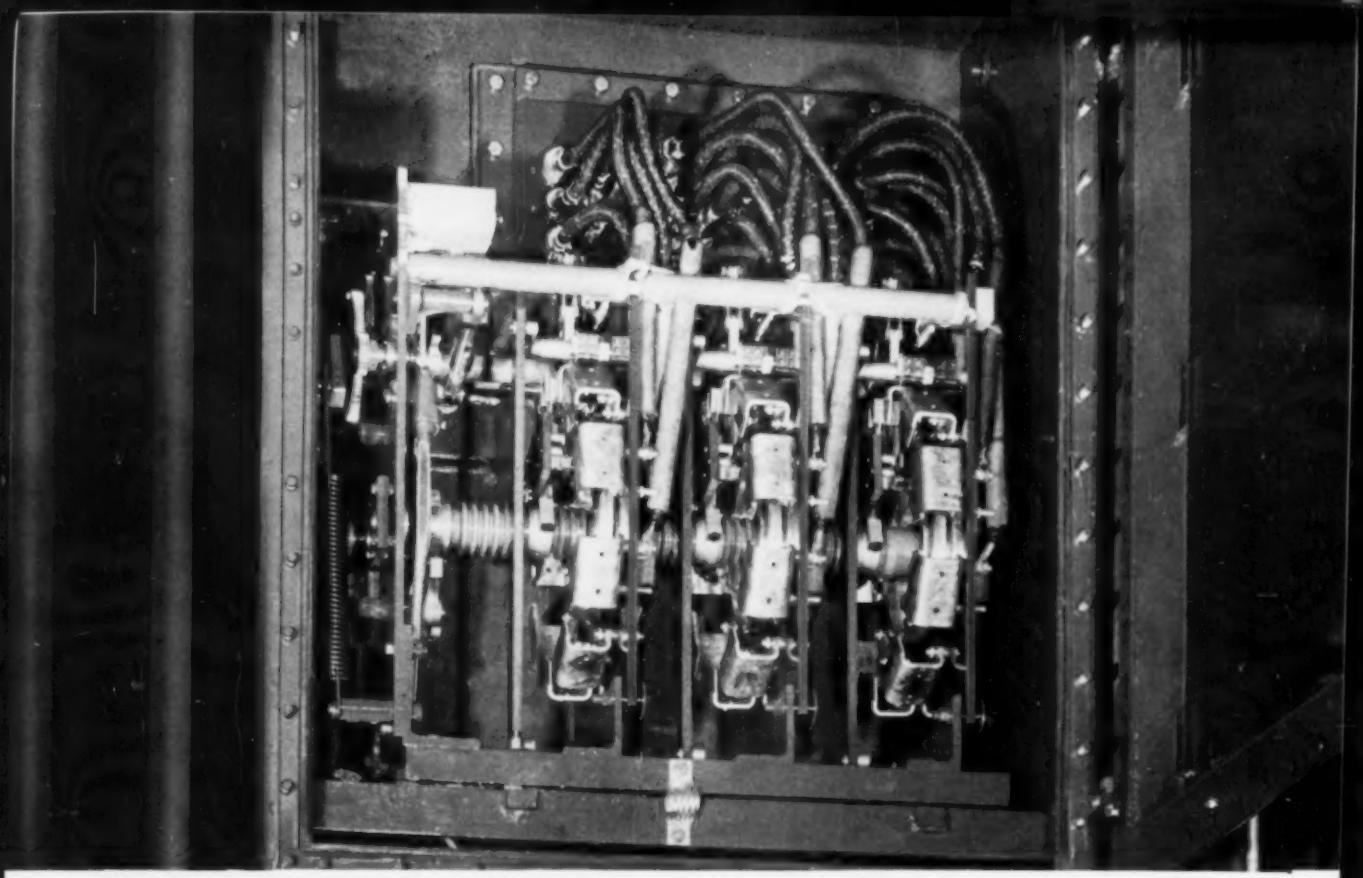
801—Motors—Bulletin describes and catalogs more popular a-c motors from 1 to 600 hp, for every process and manufacturing requirement. Single phase and polyphase; surpass NEMA specifications. — BROOK MOTOR COMPANY.

802—Small Relays—Simple solenoid design with only one moving part described in Bulletin 700. Silver alloy contacts need no cleaning, filing, or other maintenance. — ALLEN-BRADLEY CO.

811—Electric Heat—"100 Ways to Apply Electric Heat" gives a wealth of informative data on the use of electric heat in industry — fast, uniform, dependable, backed by nation-wide engineering services. — EDWIN L. WIEGAND CO.

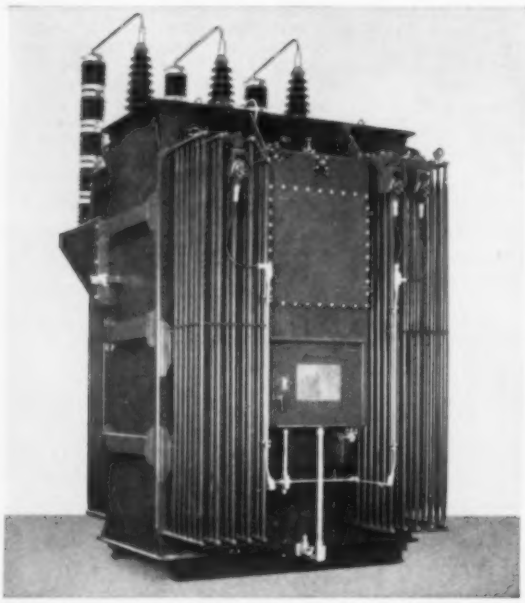
854 — Adequate Wiring — Booklet "Wire Ahead" — Discusses preventive maintenance in electrical systems — the symptoms of inadequate wiring—and plans for anticipating electrical demands. — ANACONDA WIRE & CABLE COMPANY.

(More Items — Page 102)

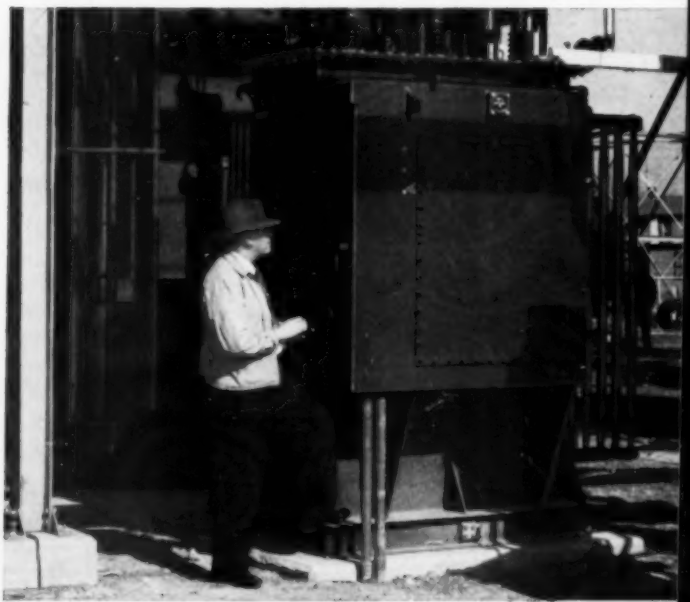


QUIETER OPERATION. Tap-changing switch compartment now houses motor and drive assembly completely immersed in oil to muffle noise and provide permanent lubrication. Formerly, motor plus assembly was in air-filled control compartment. Mounting under oil, and redesigning of geneva gear for smooth driving-pin entry—without impact—has cut peak noise level about 20 db.

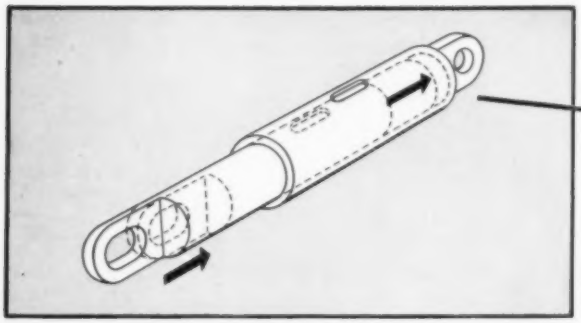
Maintenance reduced 50% by new



RM MEDIUM TRANSFORMERS employ the new LRT-68 load-tap-changing switch in LTC models.

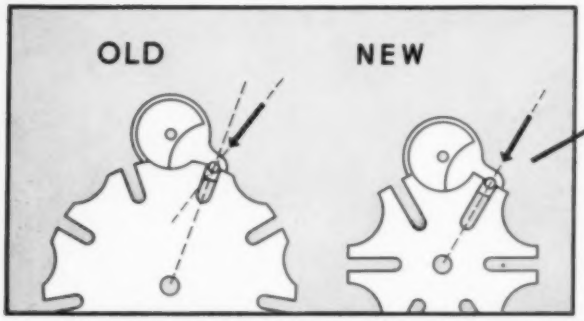


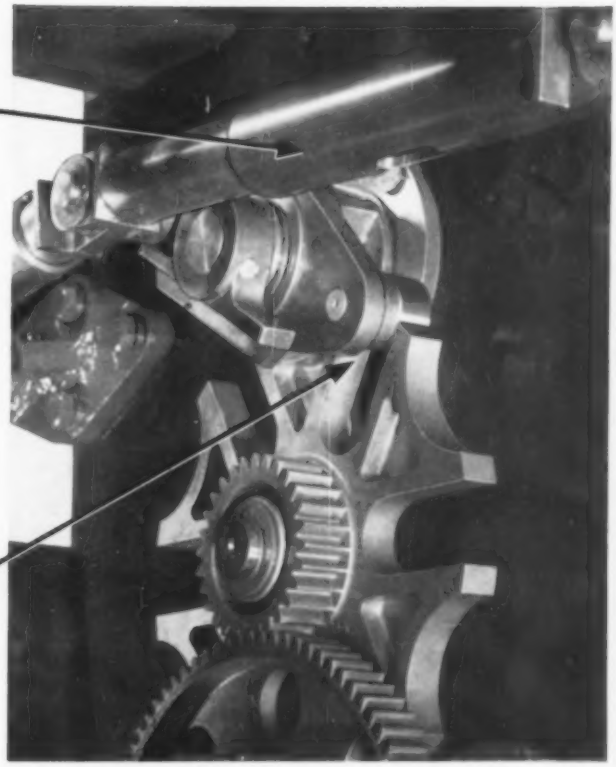
STEP REGULATORS up to 1000 kva will now have the added advantages of the new LRT-68 load-tap-changing switch.



HYDRAULIC DASHPOT

NEW GENEVA GEAR





REDUCED MAINTENANCE. LRT-68 incorporates new hydraulic dashpots and redesigned geneva gear. The two dashpots provide (1) optimum contact separation speed, and (2) reduced engagement velocity, for minimum contact erosion and less secondary arcing.

Geneva gear driving-pin now enters gear slot smoothly, parallel to the side of the slot. Previous design entered at 19° angle. Gentle acceleration and deceleration reduces jarring and mechanical wear. This, plus thicker contact tips, results in 100% increase in tip life.

General Electric load tap changer

Peak operating noise cut 20 db with LRT-68 switch now used on RM transformers and three-phase step regulators

DOUBLED CONTACT LIFE of General Electric's new LRT-68 load-tap-changing switch means routine inspection and maintenance can be *cut in half* on G-E LTC Medium Transformers, and on three-phase step voltage regulators up to 1000 kva.

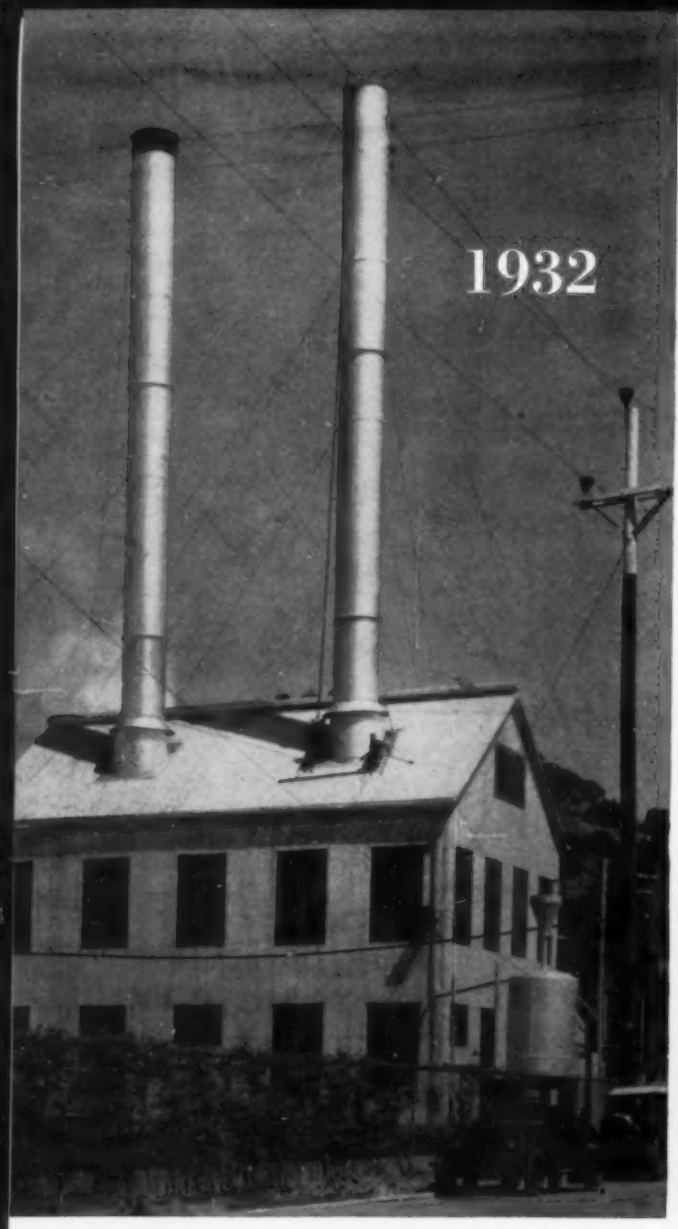
These savings have been made possible by:
(1) reducing the amount of contact wear per operation, through redesigning the geneva gear (providing smoother operation) and adding hydraulic dashpots (for optimum separation and engagement speeds) and (2) using heavier, thicker contact tips, from which more material can wear before replacement is necessary.

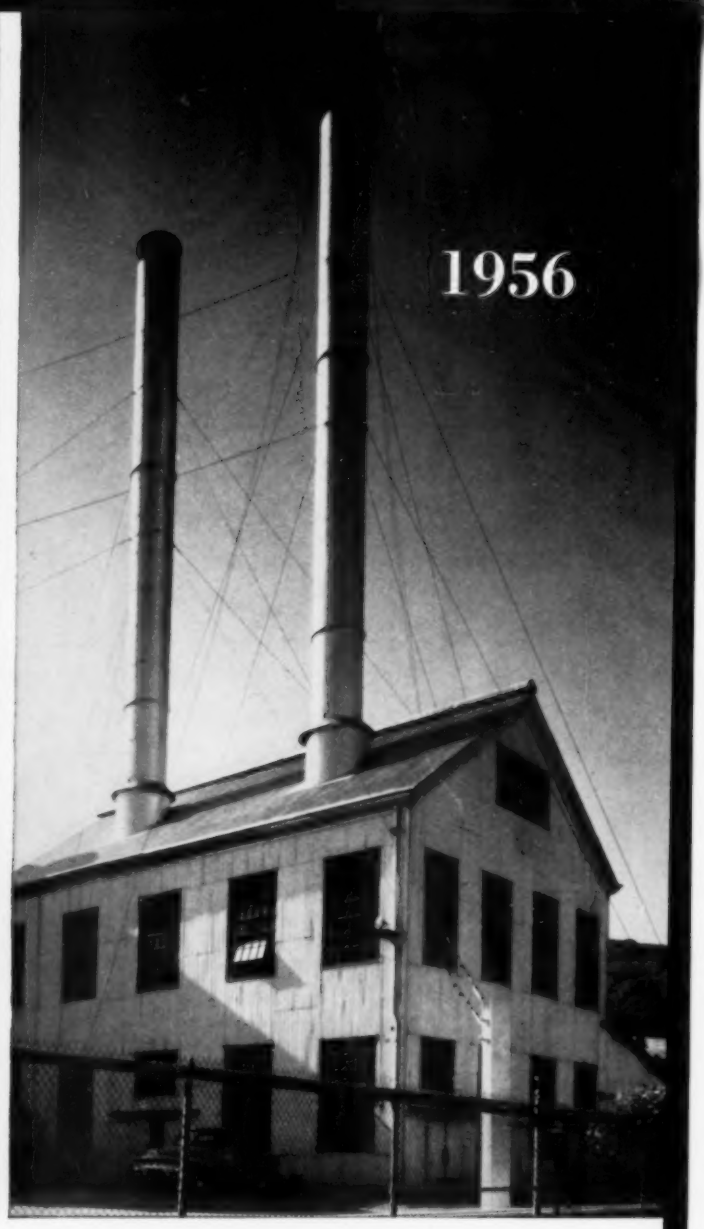
REDUCED OPERATING NOISE results from a complete redesign of G.E.'s load-tap-changer. This means increased consumer good will and less investment in sound-absorbing walls and barriers, when LTC equipment is installed in residential areas.

For full information on this new load-tap-changing mechanism and the medium transformers and three-phase, step voltage regulators on which it will be used, contact your nearest General Electric Apparatus Sales Office, or write Section 416-4, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC





Installed 24 years ago.....still in excellent condition
Here's another Wrought Iron Plate durability story

After twenty-four years of service over boilers, these wrought iron stacks still rate a "no maintenance needed" inspection report.

These stacks, installed at San Rafael, California, Gas Plant of Pacific Gas & Electric Company, tell the kind of story repeated over and over again whenever wrought iron is used. It's a story of economy made possible because of wrought iron's unique defense against flue gas corrosion.

Byers wrought iron plate is an old campaigner in stack service. You'll find documented evidence of its endurance in our bulletin, *Wrought Iron for Flue Gas Conductors and Coal Handling Equipment.* Clear up a lot of questions about stack maintenance. Write us today for this helpful aid . . . it will pay you.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Division Offices in Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N.Y.

Available in Canada and throughout the world

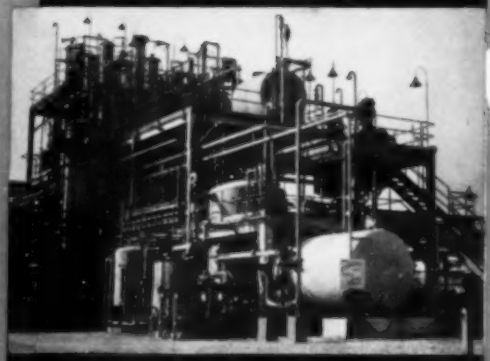
BYERS *Wrought Iron Tubular and Hot Rolled Products*

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

DROP FORGED STEEL

valves, fittings and flanges by Vogt

REFINERIES



CHEMICAL PLANTS

POWER PLANTS

USED and TRUSTED by the NATIONS KEY INDUSTRIES

There are good reasons behind the trust which America's key industries have placed in Vogt valves, fittings, and flanges for half a century. They know that *drop forged materials* are uniform in structure, fine grained, and free from porosity. They know, too, and appreciate the meticulous care given these products through every stage of forging and machining in Vogt's modern shops, and about the many rigid tests and inspections. And that is why these products enjoy such an impressive record of performance in withstanding the shocks and stresses imposed by high or low pressures and temperatures and in resistance to erosive and corrosive conditions.

Service is another important factor in this confidence because Vogt maintains the world's largest and most complete stock of drop forged steel valves, fittings, and flanges always ready for immediate shipment.

Write for Catalog F-9. Consult its 400 pages for the complete Vogt line of drop forged steel valves, fittings, and flanges for oil, steam, water, air, gas, and refrigeration services.

Address Dept. 24A-F5

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

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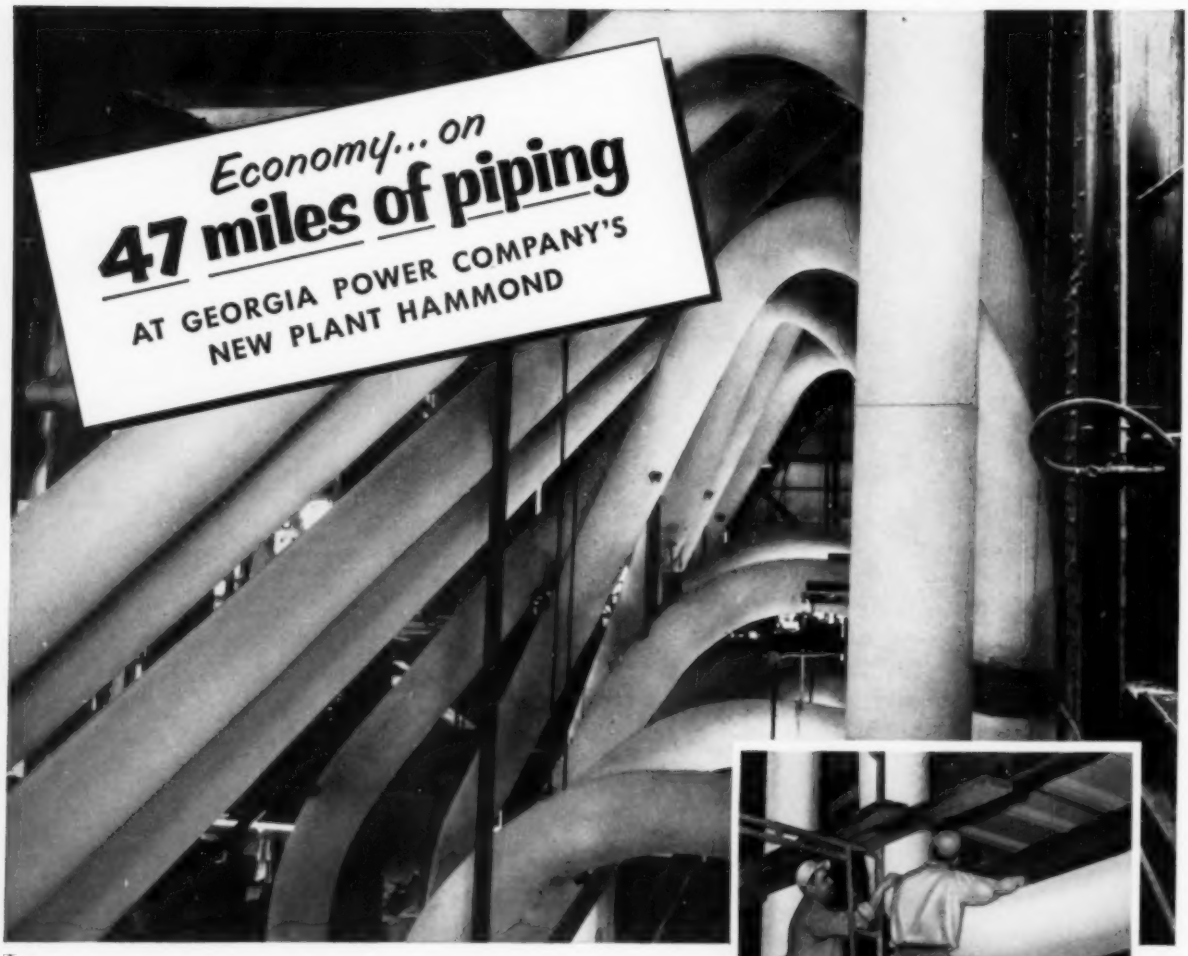
HENRY VOGT MACHINE CO. ... 75th Anniversary ... LOUISVILLE, KY.



47 miles of Johns-Manville 85% Magnesia Insulation boosts operating efficiency of Plant Hammond, one of the South's largest and most modern private utility installations.

Insulating feed water line at Plant Hammond. Contractor for this job was Brooks-Fisher Insulating Company of Atlanta, Georgia.

J-M 85% Magnesia Insulation helps cut fuel rate 25% below national average

Officials of the Georgia Power Company were gratified when the coal rate of their new Plant Hammond worked out at 0.75 lb. per KW HR, 25% below the national average. In their annual *Electrical Industry Statistics*, *Electrical World* had reported that increased efficiency in the techniques of power production has lowered the average coal rate to 1 lb. per KW HR. in 1954.

An important factor contributing to Plant Hammond's high efficiency was the selection of insulation. Johns-Manville's 85% Magnesia was applied in the most economical thicknesses throughout the plant for all piping and equipment operating in its temperature range. At higher temperatures 85% Magnesia was used in combination with J-M Superex® diatomaceous silica insulation.

This is only one of thousands of case histories where J-M 85% Magnesia has helped industry achieve outstanding fuel savings and increased operating efficiency. In all types of manufacturing and processing plants it is the standard for temperatures to 600F . . . providing high insulating value, easy application, long life, initial low cost and minimum maintenance. Write today for further information on J-M 85% Magnesia and Johns-Manville's complete drawing-board-to-job-site insulation service. Address Johns-Manville, Box 14, New York 16, New York. In Canada, Port Credit, Ontario.

JM PRODUCTS

Johns-Manville *first-in* INSULATION

MATERIALS · ENGINEERING · APPLICATION

KEEP IT CLEAN...by Phil Tration

Even the comical camel can figure a way to make his job easier with a Dollinger Staynew Filter. Whether you want to protect machines or processes, walls or workers from dirt, dust, grease, oil or other matter . . . there's a Staynew Filter to do the job economically, efficiently. Since 1920, Dollinger has actively engaged in the development of filter designs. Many of these designs are now considered *standard* by industries throughout the world.

STAYNEW MODEL CPH PIPE LINE FILTER

has the exclusive "double action principle." Air is first deflected to outer walls of Filters and forced downward at high speed. Water, oil, and heavier particles of rust, etc. are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter air-borne particles. This "double action" design eliminates need for frequent cleaning.

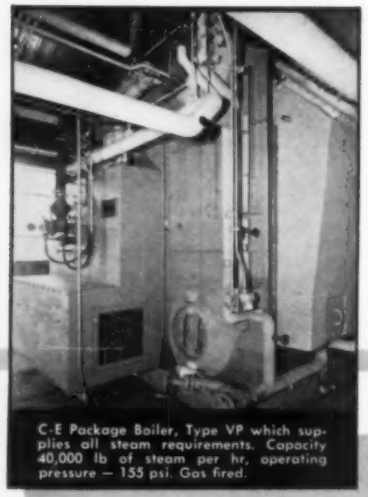
Inexpensive, simple to install, Dollinger Pipe Line Filters pay for themselves in reduced maintenance alone. Why not talk over your filtration problems with a Dollinger engineer . . . or write for Bulletin 200 which gives engineering data on pipe line filters. Dollinger Corporation, 40 Centre Park, Rochester 3, N. Y.

REG. PROTECTOMOTOR U.S. PAT. OFF.

STAYNEW **DOLLINGER**

FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS



C-E Package Boiler, Type VP which supplies all steam requirements. Capacity 40,000 lb of steam per hr, operating pressure — 155 psi. Gas fired.

"RELIABLE—ECONOMICAL —LOW ON MAINTENANCE"

Says Mr. Max R. Spencer—Superintendent Central Soya Co., Inc.—McMillen Feed Mills

From an original water color of the Central Soya Co., Inc. — McMillen Feed Mills by Kent Day Coes. Commissioned by "Factory" magazine for their 1956 Significant Plant Awards.

"Our package boiler, after 18 months of operation, has proven to be very reliable, economical and low on maintenance costs. Ease of start-up, shut-down and continuous operation permitted quick training for our operators."

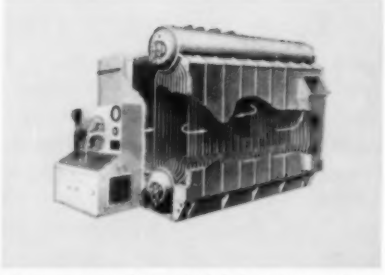
Mr. Max R. Spencer, Maintenance Superintendent of the Central Soya Co., Inc.—McMillen Feed Mills—of Chattanooga, Tenn., was referring to his C-E Package Boiler, Type VP, when he made that statement.

It's a boiler that has to be good—has to be reliable—for it is presently the sole source of steam supply for this outstanding plant. And it *is* an outstanding plant having been named one of "The 1956 Winners of Factory's Significant Plant Awards."

Central Soya is a real, modern "triple threat" operation. It comprises: (1) mammoth new grain-handling elevators, (2) feed mill, and (3) soybean solvent extraction plant all integrated into a smoothly operating "continuous process" plant that is expandable and ready for any foreseeable need.

Combustion Engineering is proud that its VP Package Boiler has been assigned a key role in the operating plan of this notable mill. Gratified, too, that it is proving to be all that Mr. Spencer had hoped for.

A C-E Package Boiler, Type VP can do the same kind of a job for you. Let us give you more information.



Cutaway view of typical VP Boiler. For capacities from 4,000 to 40,000 lb of steam per hr. Pressures to 500 psi. Oil or gas fuel.

COMBUSTION ENGINEERING

B-962A

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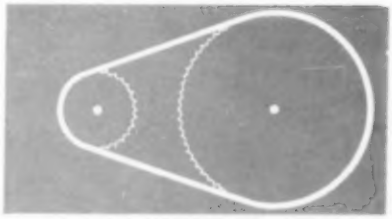
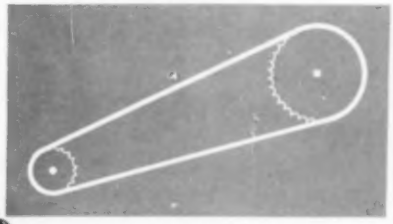
CANADA: COMBUSTION ENGINEERING-SUPERHEATER LTD.

Steam Generating Units • Nuclear Reactors • Paper Mill Equipment • Pulverizers • Flash Drying Systems • Pressure Vessels • Home Heating and Cooling Units • Domestic Water Heaters • Soil Pipe

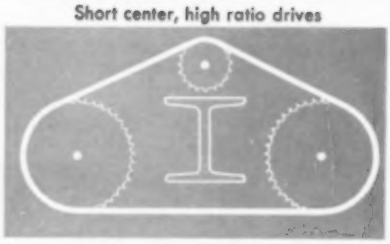
VERSATILE DIAMOND CHAINS SOLVE MANY DRIVE PROBLEMS AT LOW COST...



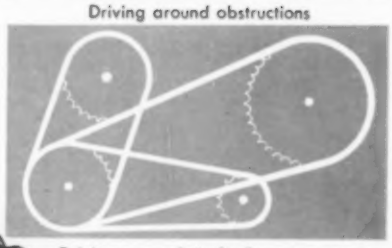
Short center, high ratio drives



Long center drives



Driving around obstructions



Driving several shafts from one source

DIAMOND

Diamond Roller Chain drives offer unequaled flexibility of application. They transmit power with non-slip precision and 98-99% efficiency regardless of shaft center distances or speed ratios.

Obstacles in the drive path are easily avoided. Diamond Roller Chain's light weight and compactness allow lighter machinery construction, eliminate power consuming gear trains and the many shafts and bearings they require.

Diamond Engineers are available now to help you solve your drive problems. Write or call today.

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DIAMOND ROLLER CHAINS

Where High Quality is Traditional

Keep plant space flexible with BLAW-KNOX Electroforged® Steel Grating

If expanding production set-ups are cramping feeder and storage areas in your plant, it will pay you to check into Blaw-Knox Electroforged Steel Grating.

Storage platforms of Blaw-Knox steel grating put unused space to work easily, economically. There's nothing to wear, nothing to patch. Blaw-Knox Electroforged grating fits neatly around pipes, beams and machinery without any alterations to the building, and, at the same time, admits maximum light and ventilation to the entire area.

Blaw-Knox Electroforged Grating for walkways, stair treads and floors is fabricated to your specifications to meet your own operating conditions. Complete data on all types is contained in Bulletin No. 2486. Write for your copy today.

50th Anniversary BLAW-KNOX 1906-1956

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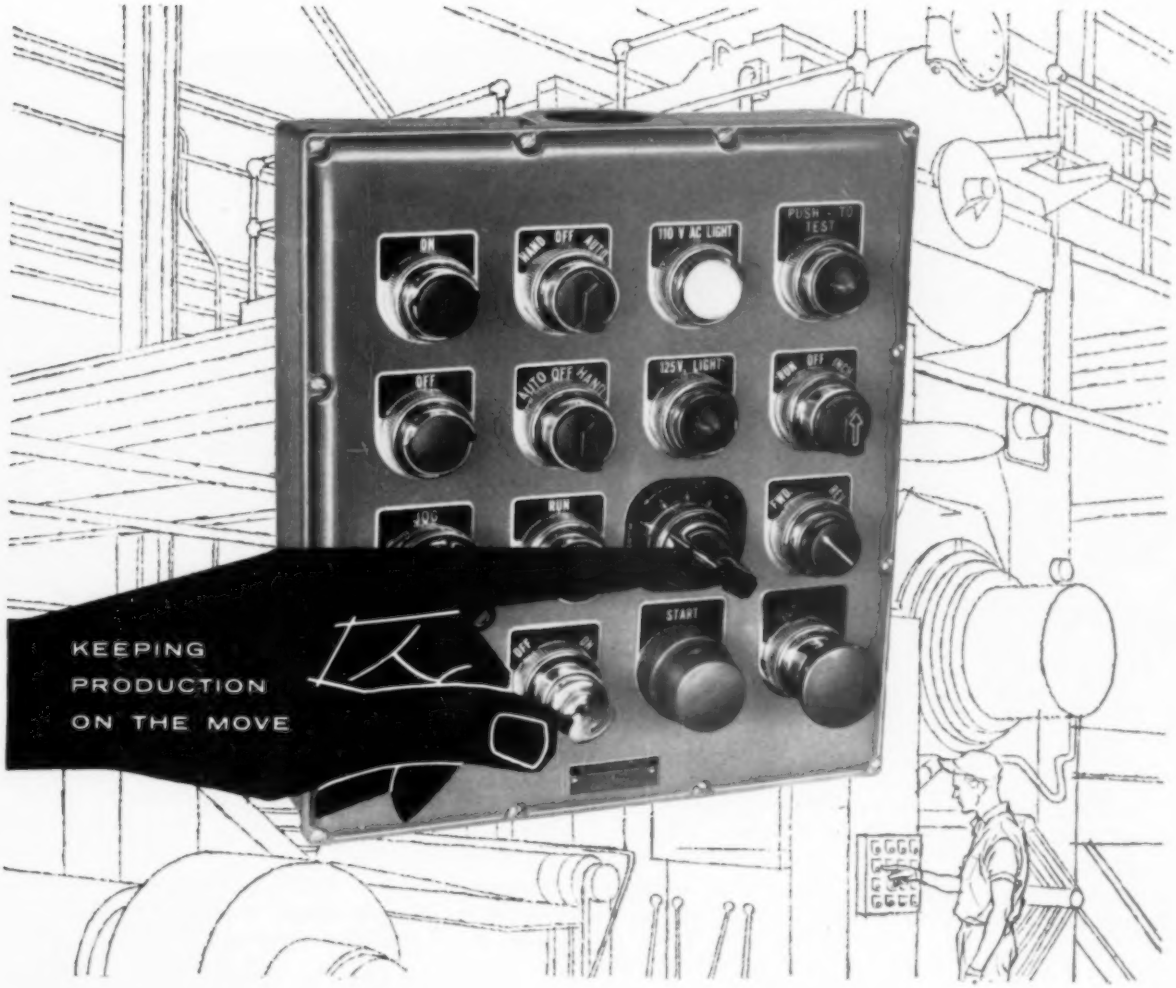


. . . with Westinghouse Oil-Tite control stations—1 to 16 units

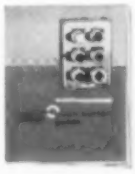
Interchangeable parts — stations, contact blocks, operators and indicating lights — right off the shelf, quickly give you a "tailor-made" Westinghouse Oil-Tite* control station to meet the requirements of any heavy-duty industrial equipment application.

Enclosures — die-cast and Bonderized — include cork-neoprene gasketing and close machine fits as positive seals against exposure to oil, coolants, cutting compounds, water and other foreign matter.

*Trade-Mark

New Pushbutton Guide

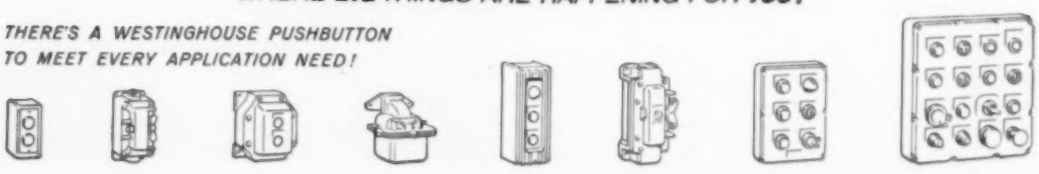
For more facts on why it will pay you to standardize with Westinghouse control stations, get a free copy of the new *Pushbutton Guide*, booklet B-6749. See your nearby Westinghouse salesman or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30210



WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*

THERE'S A WESTINGHOUSE PUSHBUTTON TO MEET EVERY APPLICATION NEED!



*Wholly owned subsidiary of South Carolina Electric & Gas Co.

REPUBLIC *Automatic* COMBUSTION CONTROLS *Anticipate* FUEL-AIR-WATER REQUIREMENTS!

● Adjusts fuel, air and water as steam flow changes ● Makes follow-up adjustment of header pressure and water level if needed ● Prevents (rather than corrects) most pressure, level and temperature fluctuations before they happen!

Planned expansion of power in the Southeastern United States is typified by the addition of Unit #3 to South Carolina Generating Co.'s Urquhart Station. Rated capacity of the steam generator is 700,000 lb/hr at 1825 psi, superheated to 1010 F and reheated to 1010 F. Designed by Gilbert Associates, Urquhart #3 is modern in performance as well as appearance.

REPUBLIC's "Electronic Master" combustion control and triple-element feedwater control permit firing of pulverized coal, natural gas, or both at once without fluctuation of header pressure or water level. This system starts adjusting fuel, air and water as soon as steam flow changes perceptibly, not waiting for either drum level or header pressure to change.

If either of these factors change despite the preliminary adjustment, the change will be very small and will be offset immediately by a follow-up control that modulates the existing control signal. Since the flow of flue gas is held in such close proportion to the steam flow, temperature at the superheater outlet is held very close to a constant 1010 F despite load swings.

This advanced control system is a logical partner to the advanced thinking apparent throughout Urquhart #3. The quick action of electronic control added to the traditional reliability and power of pneumatic actuation produces a stable, accurate, dependable automatic system. And any one or all of the automatic control functions can be cut out at will to permit substitution of remote manual control at any time. Manual controls include indicators for electronic loadings of the regulators and positioners as well as position and rate of response indicators.

Control room of Urquhart Station's modern Unit #3.

NEED HELP on "Early Stage" Planning?

Remember that Republic, too, is planning ahead. To get the latest information on developments that will effect control in your future power or processing plant, contact the REPUBLIC Engineering Department as soon as such help would be beneficial.

REPUBLIC FLOW METERS COMPANY

2240 Diversey Parkway, Chicago 47, Illinois

THESE MIDWEST "LONG TANGENT" ELBOWS SAVED $4121 IN PIPE

MIDWEST "LONG TANGENT" ELBOWS COST NO MORE THAN OTHER ELBOWS

Here are 1227 Midwest "Long Tangent" Elbows (12", 14" and 16" standard weight) ready for shipment to a chemical plant. Each Midwest "Long Tangent" Elbow has a straight section on each end equal in length to ¼ the nominal pipe size. Thus a 12" elbow saves 6" of 12" pipe while a 16" elbow saves 8" of 16" pipe. It doesn't take long to save a lot of pipe and a lot of money . . . in this instance $4121.

But saving pipe is not the only advantage of Midwest "Long Tangent" Elbows. They often eliminate short nipples and their extra welds . . . save time and money in lining up and clamping pipe and fittings . . . slip-on flanges are more easily applied. For all the facts, write for Catalog 54.

MIDWEST PIPING COMPANY, INC.

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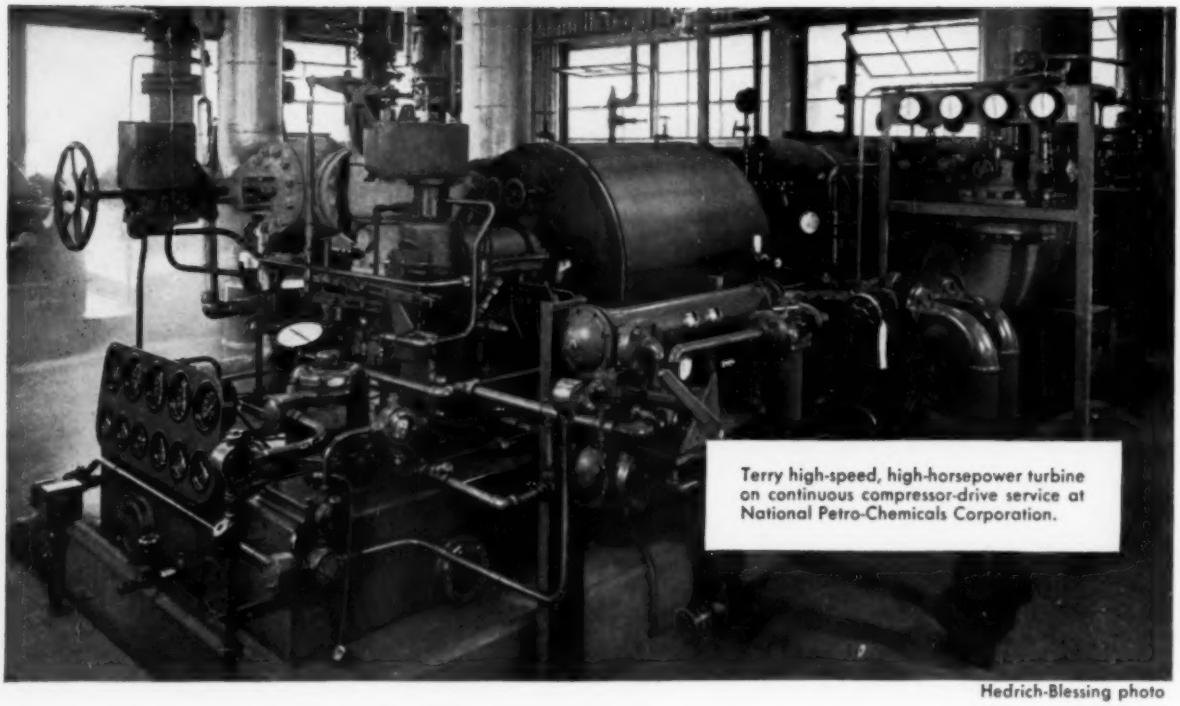
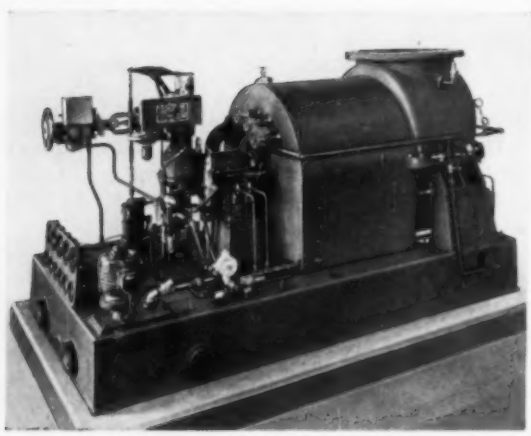


Terry high-speed, high-horsepower turbine on continuous compressor-drive service at National Petro-Chemicals Corporation.

Hedrich-Blessing photo

At National Petro-Chemicals Corporation . . .

Terry high-speed compressor-drive turbines provide continuous 'round-the-clock service



One of the two 5400 hp., 7486 rpm turbines built for the Tuscola plant of National Petro-Chemicals Corporation.

In the fall of 1953, five Terry multistage turbines were placed on day-and-night duty at the Tuscola, Illinois, Plant of National Petro-Chemicals Corporation. They drive high-speed compressors used to compress hydrocarbon gases in the production of ethylene.

The *excellent performance of these initial units later resulted in the installation of two more Terry machines.* These were placed in service some two years later.

In all, the seven turbines total more than 30,000 hp. They range in capacity from 3300 to 5400 hp., and in speed from 7500 to 9700 rpm.

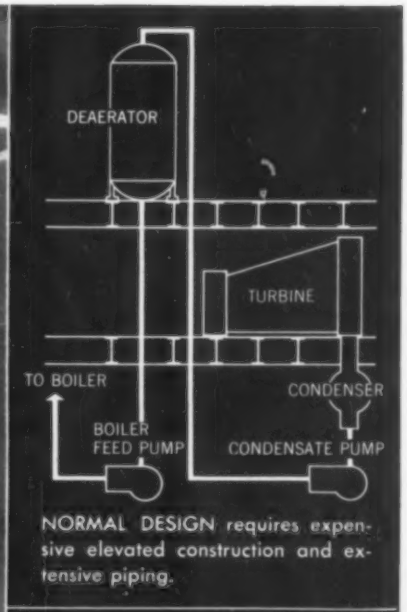
The National Petro-Chemicals installation, and the thousands of other units serving in refineries and chemical plants throughout the world, are testimony to the low maintenance and consistent reliability of Terry turbines. Put Terry to work for you. Write for further information.

THE TERRY STEAM TURBINE CO.

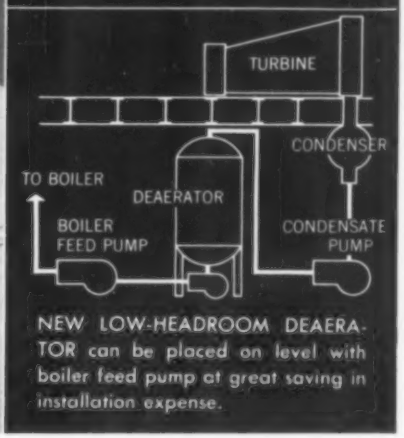
TERRY SQUARE, HARTFORD 1, CONN.

TERRY

TT-1207



NORMAL DESIGN requires expensive elevated construction and extensive piping.



NEW LOW-HEADROOM DEAERATOR can be placed on level with boiler feed pump at great saving in installation expense.

New low-headroom deaerator makes oxygen removal economical for the smaller plant

Now every plant, large or small, can cut steam plant maintenance . . . and do it economically . . . by using deaerators. A new "low-headroom" deaerator, just developed by Worthington, allows you to install the unit *inside* your power house. You don't have to pay for expensive elevated mounting and complicated piping!

To provide adequate water pressure, it used to be necessary to elevate the deaerator above the boiler feed pump intake. A small pump on the new "low-headroom" unit now furnishes this pressure without the need for elevation. Result: considerable saving on installation and piping.

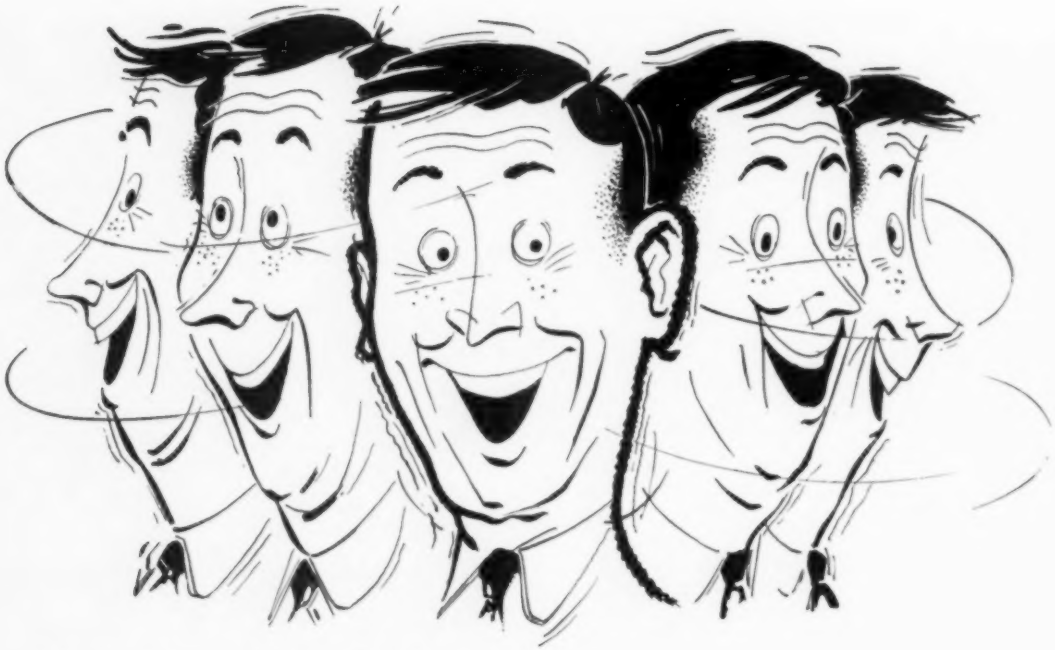
A patented* recirculation system prevents vapor-binding and provides means for preheating and deaeration before start-up. It gives you maximum oxygen removal even under abnormal operating conditions.

Available in standard sizes up to 80,000 pounds per hour, and larger in "tailored" designs, the new "low-headroom" deaerator can be installed in your plant in a matter of weeks. For more information call your nearest Worthington District Office or write Section S63, Worthington Corporation, Steam Power Department, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Toronto, Ont.

5.6.3

WORTHINGTON

*Patent No. 2308719-20 & 21 2564583 — other patents pending



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lives up to its name!

When you buy coal, you buy heat . . . or power . . . or specific results from special purpose use. From many years of practical experience, the Norfolk and Western's coal specialists have learned that even the slightest difference in coal quality can affect an operation. They know, too, that there's a coal best suited for particular requirements . . . a coal that consistently meets specific utilization needs efficiently and economically.

Fuel Satisfaction — the name given the many brands of superior all-purpose Bituminous Coal mined along the N&W — has been satisfying the varying fuel requirements of industrial coal users for more than 70 years.

Experienced coal men believe Fuel Satisfaction is the best buy on the market. Try the kind that best lives up to your requirements — and you'll find that Fuel Satisfaction lives up to its name.

Let us tell you about the types of Fuel Satisfaction you can utilize best. The N&W maintains eight Coal Bureaus staffed with men who know coal. Their service is yours without obligation. Call on them.

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Boston 10, Massachusetts

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Room 604, 208 South
LaSalle Street
Telephone RAndolph 6-4634
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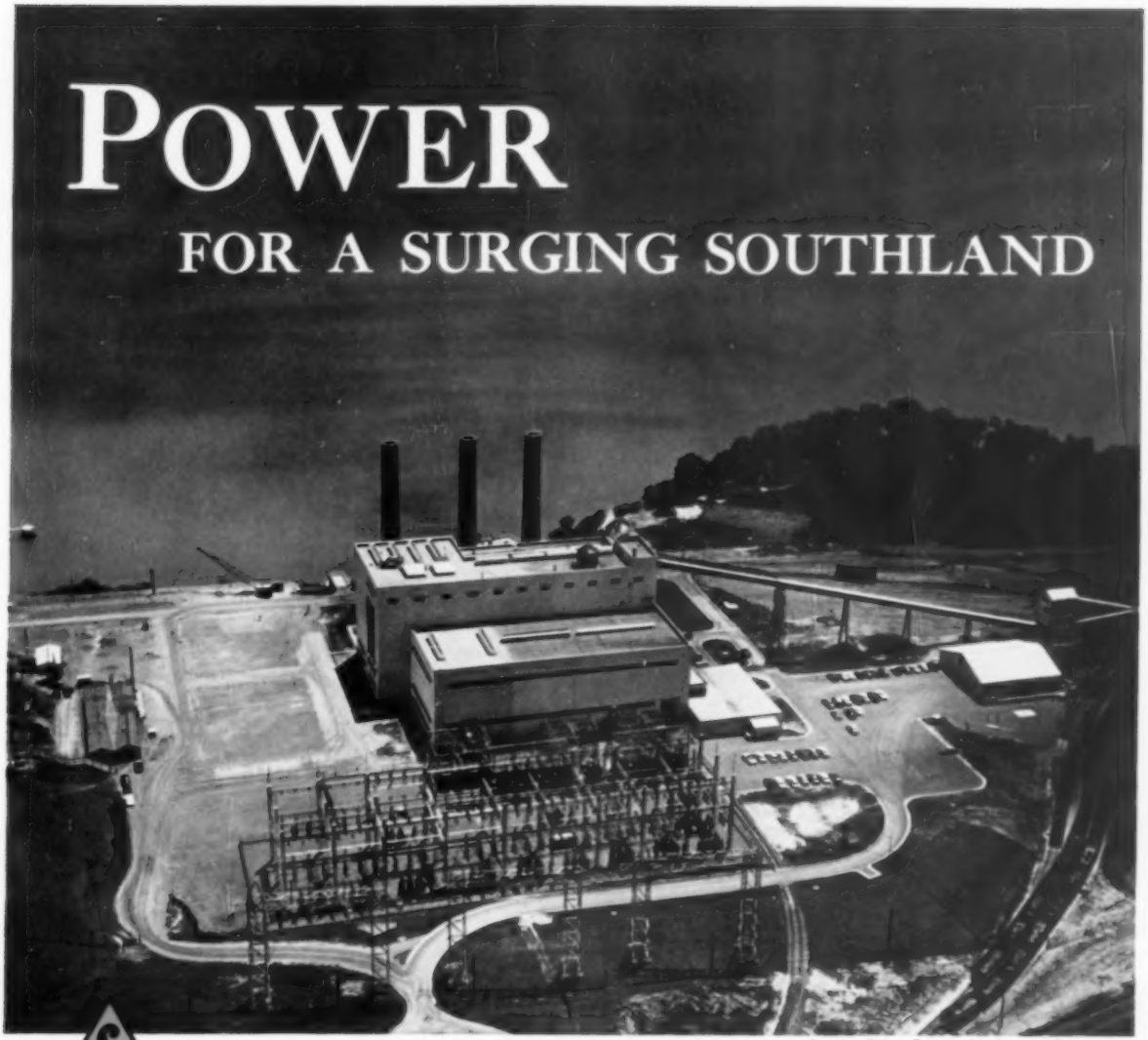
POWER
FOR A SURGING SOUTHLAND



Possum Point Power Station with a name plate capacity of 220,000 kw is located on the Potomac River near Quantico, Virginia

The third generating unit of the Possum Point Station of the Virginia Electric and Power Company – designed and built by Stone & Webster Engineering Corporation – went on the line in mid-1955, with a name plate rating of 100,000 kilowatts.

The Engineering Corporation is presently installing four 150,000 kilowatt units in three other generating stations being designed, constructed or extended for this client for commercial operation in 1957, 1958 and 1959.

These additional power facilities are examples of the forward looking steps being taken by Virginia Electric and Power Company to satisfy the rapidly expanding power requirements of the VEPCO system.

Write or call us for information as to how our experience can be of assistance to you.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY of STONE & WEBSTER, INC.

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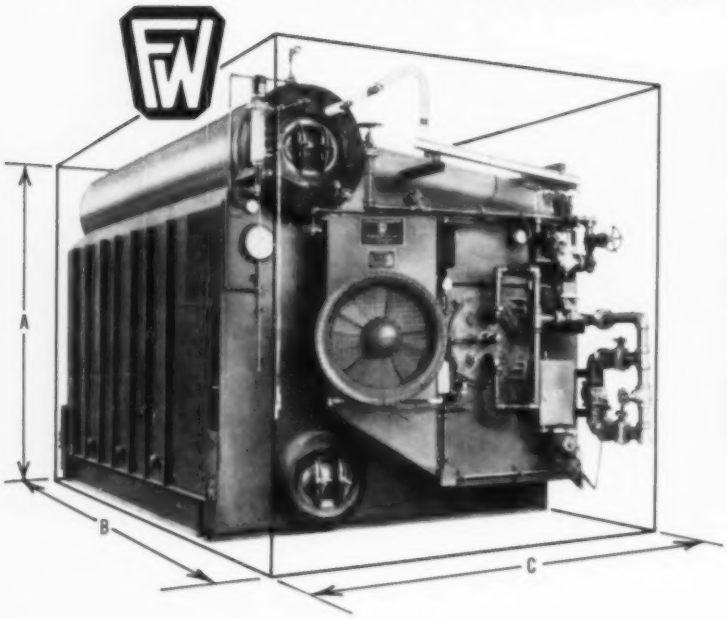
SAVE TIME · SAVE SPACE · SAVE MONEY

. . . with the new Foster Wheeler



PACKAGED STEAM GENERATOR

CAPACITY RANGE AND DIMENSIONS

CAPACITY lb/hr Based on 100 psi, 212F Feedwater and Zero Blowdown		A	B*	C
#6 OIL FIRED	NAT. GAS FIRED			
13,400	12,900	12′ 1¼″	14′ 6¾″	10′ 11¼″
15,600	15,000	12′ 1¼″	15′ 7½″	10′ 11¼″
17,800	17,100	12′ 1¼″	16′ 8¼″	10′ 11¼″
20,000	19,200	12′ 1¼″	17′ 9″	10′ 11¼″
21,800	20,700	12′ 1¼″	18′ 9¾″	10′ 11¼″
24,000	22,800	12′ 1¼″	19′ 10½″	10′ 11¼″
26,200	24,900	12′ 1¼″	20′ 11¼″	10′ 11¼″
28,400	27,000	12′ 1¼″	22′ 0″	10′ 11¼″
30,600	29,100	12′ 1¼″	23′ 0¾″	10′ 11¼″
32,800	31,200	12′ 1¼″	24′ 1½″	10′ 11¼″
35,000	33,300	12′ 1¼″	25′ 2¼″	10′ 11¼″
37,200	35,400	12′ 1¼″	26′ 3″	10′ 11¼″
39,400	37,500	12′ 1¼″	27′ 3¾″	10′ 11¼″
41,600	39,600	12′ 1¼″	28′ 4½″	10′ 11¼″
43,800	41,700	12′ 1¼″	29′ 5¼″	10′ 11¼″
46,000	43,800	12′ 1¼″	30′ 6″	10′ 11¼″

**Varies with method of firing and type of combustion controls. Figures listed provide safe approximation over firing and forced draft equipment.*

HERE's a *complete line* of packaged steam generating units that are built to power boiler standards . . . designed and constructed to offer these important savings.

You *save time* because they are shipped completely assembled, all ready to set on a simple foundation and connect to your fuel, steam and electric power lines.

You *save space* because all packaged units are extremely compact — designed for shipment on standard railroad flat cars. They provide high output in lowest possible installation space consistent with safe rates of heat liberation.

You *save money* because all units are shop fabricated from standard parts, simple to install, and designed for sustained high efficiency and exceptional ease of inspection and servicing.

Construction features include: 36″ steam drum and 24″ water drum — staggered boiler tubes — closely spaced waterwall tubes — effective circulation — light, highly efficient refractory and insulation — wide choice of burners and controls — baffled steam collector.

In addition to the standard units listed here, FW Packaged Steam Generators are also available for design pressures to 1300 psi, with superheaters giving up to 825 F final steam. FW extended surface economizers provide maximum efficiency at these higher pressures and temperatures. For complete information send for Bulletin No. PG-55-3. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

Greenlee cuts steam costs 18%-20% burning coal the modern way

Consult an engineering firm

Designing and building hundreds of heating and power installations a year, qualified engineering firms can bring you the latest knowledge of fuel costs and equipment. If you are planning the construction of new heating or power facilities—or the remodeling of an existing installation—one of these concerns will work closely with your own engineering department to effect substantial savings not only in efficiency but in fuel economy over the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

Expanding facilities at Greenlee Bros. & Company, Rockford, Illinois, created a problem common to many growing firms. The Company's three old boilers had to operate continually at maximum capacity, so that a forced outage could hurt plant production. In addition, peak load operation with outmoded equipment resulted in high fuel costs.

While the newest boiler was retained, Greenlee replaced the other two with modern high-capacity units, including stokers, up-to-date controls and other equipment for more efficient operation. A new, pneumatic ash handling system was installed. Today Greenlee is getting 10%-20% more steam for each pound of coal burned and steam costs are down 18%-20%, saving Greenlee thousands of dollars every year.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

BITUMINOUS COAL INSTITUTE

Southern Building • Washington 5, D. C.

2 TO 1 *in Your favor*

CHAPMAN MOTOR UNITS

...for Valves, Floorstands, and Sluice Gates

It's a matter of simple mathematics. Take any one of Chapman's Motor Units and look it over carefully. You'll find approximately half as many parts as with any other make. This means the chances of cutting maintenance costs are two to one in your favor.

The odds can be even better. With Chapman Motor Units, you not only get simplified design, you also get sturdy construction and smooth, accurate performance over a longer period of time. There's no drift. Backlash is low. An accurate micrometer-controlled limit switch keeps seat tightness at any predetermined level.

Two points more — with Chapman Motor Units there's no trouble with either operating positions or operating conditions. Rugged stub-tooth gears require no grease or oil . . . operate at any angle . . . and the complete unit is not only weatherproof. It's *steam tight.*

Even on installation there's a chance of saving money with Chapman Motor Units. When used with floorstands they are completely wired at the factory . . . ready to connect and work. It's an easy, simple, low-cost job.

Chapman Motor Units for valves, floorstands, and sluice gates are outlined in full in our Catalog 51. If you don't have it, write for it, right now.

THE CHAPMAN VALVE MANUFACTURING CO.
INDIAN ORCHARD, MASS.

INDUSTRY SPEAKS

Business Interdependence Studied

Du Pont Company report shows how big and little businesses serve each other.

THE VITAL interdependence of big and little business is strikingly documented by a recent Du Pont Company study which discloses that small companies number more than nine-tenths of the chemical concern's 75,000 customers and 30,000 suppliers.

The overwhelming number of little companies on which Du Pont depends is a sharp reminder that the great majority of U. S. business firms are small and that they are among the best customers and most reliable suppliers of big business. More than 93 per cent of U. S. manufacturing firms employ fewer than 100 workers, while 98 per cent of all businesses—manufacturing, trade, and service establishments—have less than 50 employees.

Customers Developed

The Du Pont study also discloses that many of the industries in which small businesses thrive today had their origin in long and expensive research projects of the large companies.

One of 4,000 small companies in the plastic products industry, making molded parts of "Zytel" nylon plastic, is cited. Beginning in 1948 with two employees working in a small garage, it now employs 50 in a modern plant, turning out gears, bearings, and auto parts.

A few years ago Du Pont developed "Teflon" resin finishes. When these finishes are applied to metal, nothing will stick to the surface. Not a metal coater, Du Pont passed along its know-how to all interested firms. To date, more than 30 small companies, all custom applicators, are treating metal for fabricating bakery and candy machines, heat-sealing and other special equipment. Many similar examples are cited.

It is important to recognize that this is not an example of altruism on the part of Du Pont, but a demonstration of the interdependence of big and little business. Du Pont benefits because it sells the "Teflon" to the small firms.

Supplies Purchased

In buying annually thousands of items ranging from paper clips to power plants, Du Pont, like most big business, finds that for many jobs the small supplier—who accounts for 93 per cent of Du Pont's 30,000—is the only answer. This is especially true for much of the special plant equipment which must be virtually "tailor-made" to exacting specifications. Such equipment is often supplied by certain small fabricators that have the highly skilled manpower and know-how necessary to do these jobs.

Numerous examples are cited in the Du Pont study to show the advantages of cooperating with small fabricators. Big business finds it is good business to use the small supplier as much as possible. To give only one example from the Du Pont study—but a typical one—last year Du Pont spent $293,000 on goods and services for one of its plants from 96 firms in a small southern town of less than 10,000 population. Furthermore, another $708,000 was spent with 249 firms, nearly all small, located throughout the state.

The survey turned up a number of small manufacturers whose entire output is channeled toward a specific Du Pont need. Small as they are, some of these companies are "volume" producers.

Survival High

In 1955, more new corporations were formed than in any year in U. S. history. Almost 90 per cent employed less than 20 people. The survival rate is high, showing a net gain of 92 per cent.

These facts, together with the experience of big companies as typified in the Du Pont study, contrast sharply with the idea that big business is thriving at the expense of the little fellow. The truth is that there is a job—in fact, many jobs—for each. Big and little business are mutually dependent.

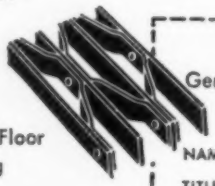
EDITOR'S COMMENTS:

These accomplishments are impressive and commendable, but much "planning for the future" is needed to improve the survival potential for small business if the present high prosperity declines even slightly.

(*Continued on Page* 41)

Borden Grating for Bridges and Roads

- **MAXIMUM TRACTION** — greater safety, cuts accumulation of ice, snow, oil or grease.
- **EASY TO INSTALL** — engineered in conveniently sized units for easy installation.
- **EXTRA STRONG** — reinforced, designed with maximum safety factor.
- **LIGHT WEIGHT** — approximately 80% open, reduces dead weight, allows greater live load.
- **SELF-CLEANING** — creates greater safety, economy of maintenance, no sweeping or washing required.



Write for complete information on BORDEN All/Weld, Pressure Locked, and Riveted Floor Gratings in this FREE 8-page catalog

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SOUTHERN PLANT—LEEDS, ALA. — MAIN PLANT—UNION, N. J.

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COMPANY NAME .....

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TIMELY COMMENTS

SOUTHERN POWER AND INDUSTRY

Big Business and Little Business

Dependence and Dependability

THE accomplishments and motives evidenced by the Du Pont study briefed on page 39 are commendable. The report will be heartening to the vast number of Americans that consider success and survival of our small businesses important to the nation's economy.

The statements and statistics are correct, and the report presents a pretty picture. We like it. Nearly every one will like it. But the need to keep this satisfactory picture from fading is great. And it can fade.

A Job to Do

These comments are intended to commend success and encourage planning for continued success in the future. The small plant is extremely sensitive to national prosperity variation. They grow "like Topsy" on a rising economy and die by thousands when the buying cycle dips.

In spite of the hard core of small business (management is close to the wheel) they cannot prosper without adequate sales and supplies. And big business determines to a large extent the sales and supplies—just as Du Pont points out.

Big business has a much greater chance for survival in times of stress and depression. No matter how paternalistic our government may be toward small business the fact remains that large plants must be kept in operation during periods of stress. The nation cannot afford to have them fail. Failure of large plants means national chaos—and everything possible will be done to prevent it.

So regardless of all other aids, the prime responsibility for keeping small plants going falls on big business. What can they do about it? We do not know. But certainly some of our great research organizations and industrialists should be working on the problem.

Here, as in all success, the key word is confidence. And confidence is built on experience.

Research should be directed toward finding means to avoid cutting-off the small customer or supplier first when someone has to be cut. The answer will not be easy to find because responsibility for a down cycle does not in any sense fall on big business. The damaging procedures seem to a large degree unavoidable, and the answer impossible. But the recent phenomenal rise of research organization is based on finding ways to do the "impossible." We hope they can do it again.

Here is what happens. The big plant feels the effect of depression first — fewer orders, less work for their plants. In the first stages they try to hold the fort by increasing stocks. But that costs money. Survival for big plants is hard too.

Then they cut off a few production hours, but try to hold their forces together. That is where trouble for small business starts. Big plants start doing things that normally are handled by contract or purchased through small plants. That hits the independent small supplier of men and materials. You don't contract a painting job if your own maintenance men have spare time on their hands.

Then the big plants start looking around to use their own excess man power to give further finishing to their own basic products. That cuts off material to previous small customers.

So it has been in the past, and so it may be again. Even a slight dip in our economy cuts deeply into small industries' profits.

That explains what we mean when we say it is a research problem. Good intentions and fair dealings on the part of big business are not enough. The right solution will come from sound business principals rather than altruism. It is a job for research and study.

It Will Pay

Small businesses that are tied closely to big businesses require careful planning, and those that depend largely on one outlet or one supplier particularly need assurance. Research must try to replace doubt and uncertainty with dependability and confidence.

As Du Pont points out big business profits from the success of small business. Finding the answer will result in greater success and smoother operations for all. But the job must be done without subsidy. Subsidy is expensive.

Louisiana Manager of Plant Utilities Department Tells
How to Get Maximum Benefits With Low Capital and High Reliability

High-Quality ELECTRIC SERVICE

By JAMES D. RAMSEY

Manager of Utilities Department
Norco Refinery
Shell Oil Company
Norco, Louisiana

Mr. Ramsey was employed at Shell Oil Company's Wood River, Illinois Refinery in 1947 as an Electrical Engineer. Two months later he was promoted to Foreman in the Utilities Department and in 1952 was transferred to Shell's Norco, Louisiana Refinery as a Senior Engineer. After serving two years in that position, he was named Manager of the Utilities Department. Mr. Ramsey is an Electrical Engineering graduate of the University of Tennessee.

This article has been adapted from a discussion presented by Mr. Ramsey at the 28th Annual Convention, Petroleum Electric Power Association at Corpus Christi, Texas.

THE "HIGH-QUALITY" concept of electrical service has long been present in the thinking of engineers and operating personnel associated with continuous process plants—petrochemical, petroleum, magnesium and aluminum producing plants, petroleum refineries, etc.

The refinery of today is usually one large integrated process, each step of which is dependent upon others. To reduce in-process storage facilities to a minimum, intermediate products continuously move from one unit to another. Thus, a failure in one unit may disrupt operations on a refinery-wide basis. Keeping a large refining operation on stream twenty-four hours per day is essential to profits in a highly competitive industry.

With such designs, the weak links in continuity of operation are frequently the plant services such as steam, water, air, and electricity. Of these utilities, the electric service is most often singled out as the weakest link in the chain. This is understandable when we consider the many sources of outage to which the power supply to units is subject — faults in various types of equipment utilizing the service; natural phenomena such as lightning, winds, tornados; over-voltage conditions and switching surges; mal-operation of relay system; cable and insulator failures; and damage from foreign objects such as birds, kites, automotive equipment, and cranes.

However, reliability is by no means the only problem which must be considered in the design of electrical systems. The problem of safety is of the utmost importance. Refinery distribution systems operate in areas where volatile fluids or gases are constantly in circulation. Fire and explosion are a threat to life and property and must always be considered.

Reliability & Costs

While maintaining systems high in reliability and engineered to operate under hazardous conditions, the question of economics cannot be forgotten. Process improvements come rapidly. Consequently, in the design of refinery power systems, the engineer is keenly aware of capital costs and is constantly on the lookout for ways and means of reducing expenditure and yet preserve the basic concepts in the design of the system. Many economic studies are usually made before final selection of methods and equipment is made. This often seems like an impossible situation to combine extreme reliability with lower capital outlays, but with careful planning and some compromises without the sacrifice of basic principles, this can be done.

In the early periods of refining operations, steam was the major source of power supply to prime movers. For a long period after the increased utilization of electric motor drives in the refinery operations, reliability of the electric power supply was questionable from the refinery point of view. Designers would only consider steam turbines, steam engines, or gas engines for important machine drives. Steam for these drives was usually generated in the refinery boiler plant at pressures required for the prime mover.

Purchased power service to the refineries in these early days was usually supplied by a single line from a single substation in the power company system with little or no provisions for standby sources. This was not conducive to the widespread use of electrical drives in the refinery units since the outage frequency on this type of system was usually high.

The next step toward what was at that time considered a more reliable and economical type of

service was taken by the refineries themselves. Since nearly all refineries required large amounts of steam in the process which was usually supplied by medium pressure boilers, the larger refineries began self-generation of the whole or part of their power requirements using higher pressure boilers and topping turbines. Steam from the turbine exhaust could then be used to supply process requirements at the lower pressure level. This proved advantageous from an economic standpoint, but another great advantage was the reliability of a system contained in a refinery area as compared to a large utilities system in a wide area subjected to many more disturbing influences.

To further augment their own generation, and to guard against turbo-generator or boiler failure, many refineries negotiated agreements whereby their own facilities were operated in parallel with purchased power tie lines. This arrangement offers a high degree of reliability, and at the same time offers maximum flexibility in refinery operations.

To compete successfully with these types of systems, the power company must be prepared to equal the service continuity of the facilities which the customer can otherwise economically provide for himself. The power companies have accepted this challenge and achieved outstanding results. The isolated generating plant in the utilities system, one reason for unreliability, has been practically eliminated by tie lines between multiple sources of generation. Probability of line outage to the customer has been further reduced by duplicating the tie lines to the loads and providing fast automatic switching facilities for transferring from one source to the other in event of failure.

The problems encountered in the development of high-quality electrical service can best be solved by a free interchange of ideas between the power company and the customer.

System Development

Prior to the construction program which began in June, 1952, the electrical load of the Norco Refinery, approximately 2500 kva, was supplied 50% by generation and 50% by power purchased from Louisiana Power and Light Company. Generation at Norco was a carryover from the earliest operations in 1921 at which time purchased power tie lines were not available in the area. The first purchased power tie line from Louisiana Power and Light Company was installed in 1928. This first service consisted of two tie lines, one line considered the normal source, was connected to the LaPlace Substation which is located approximately three miles from the refinery. The second source, considered the emergency service, was connected to the Snake Farm Substation located approximately fourteen miles from the refinery. Automatic switching facilities were located at the refinery which would transfer the load to the emergency supply at the end of a five-second outage on the normal supply.

In the development of the new system, economic studies resulted in the decision not to provide additional generation but rather to supply the new requirements with purchased power. In the course of the studies it was found that all available high-pressure steam could be more profitably used directly in large turbine drives for process equipment than in electric power generation, and it was therefore decided to purchase all additional power requirements. However, the existing facilities were not considered adequate from a reliability standpoint due to long secondary tie lines, the lack of fast transfer equipment, and the general construction of the secondary lines, particularly since some parts of the secondary ties were unshielded.

With these thoughts in mind, we began a series of conferences with Louisiana Power and Light Company in the early part of 1951. It is interesting to note that this was approximately fifteen months before any actual construction at Norco, and over three years before any units were expected to go on stream. Actually, at this time, Louisiana Power and Light Company had several system expansions and revisions in progress scheduled for completion in 1953.

Working very closely with us during the next few months, they proposed to install a new substation which would be designated as the Norco Substation, and would be located adjacent to our property. A one-line diagram of this station, as constructed, is shown in Fig. 1.

From this substation, power is delivered to the main incoming line substation within the refinery utilizing two overhead tie lines. These two lines are approximately 1500 ft in length and follow two different routes through our property to the substation in order to minimize the danger of losing both lines at the same time due to lightning or other emergencies. The two lines are of the wishbone construction, using 1,000,000 CM aluminum conductors. These lines are insulated for 33 kv even though operating at only 13 kv. Also, the lines are completely shielded, the overhead protection system of the two lines being an integral part of the shielding sys-

SOME FEATURES and problems which are frequently encountered in the design of high quality electrical service for processing plants are presented. The author emphasizes that everyone may not agree with the methods used nor will the methods be applicable to every location. Each new design must be treated as an individual case.

IN THE DESIGN work at Norco, Shell engineers have tried not to be completely dominated by what has been done before. As long as basic and proven design principles with reference to safety and reliability are not violated, they have not hesitated to proceed with new ideas.

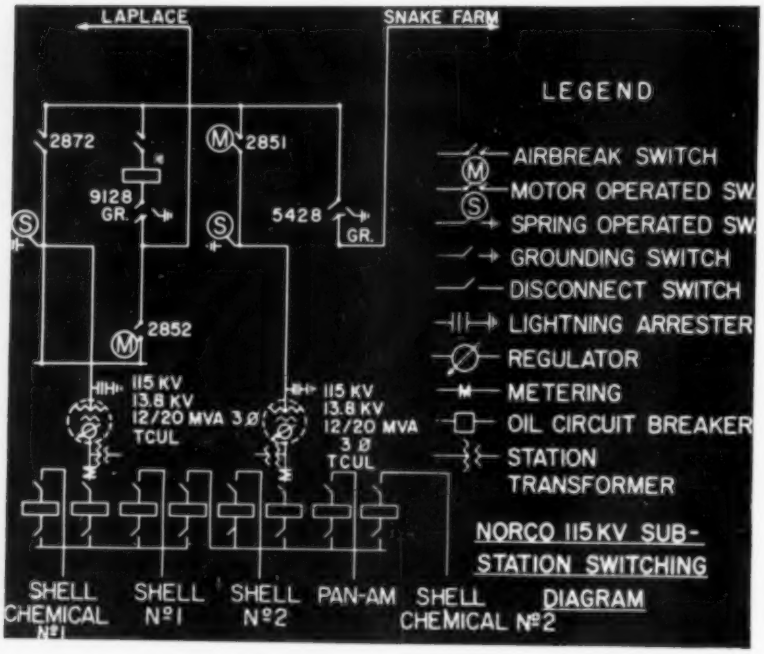


Fig. 1 — Louisiana Power & Light Company's Norco Substation delivers power to main incoming line substation within the refinery utilizing two overhead tie lines. Station includes dual transformers and adequate automatic switching facilities for isolating lines in trouble and maintaining service to the refinery.

tem at the Norco Substation on the one end and the main incoming line switchgear at the other end.

The selection and design of the main incoming line switchgear presented some problems and is a good example of how economies in initial capital expenditure must ever be a consideration in design. In the system at this location, we selected double bus switchgear for reasons of flexibility in maintenance and other operating problems. However, in this case the selection of double bus gear presented two problems, namely:

(1) At the time of purchase, the double bus unit did not meet our construction schedule.
(2) The initial cost of a double bus unit was considerably in excess of a standard single bus unit.

As a final outcome, two single bus units, each having one main incoming line breaker and the required number of feeder breakers, were purchased. (See Fig. 2) A double bus arrangement was achieved by connecting the two units with a bus tie and each of the feeder breakers with tie lines overhead in conduit. This installation provided the desired flexibility with some economy in initial capital expenditure.

All oil circuit breakers in this switchgear have a short circuit rating of 500,000 kva. This is considerably in excess of the present duty imposed on this gear; however, we have had unfortunate experiences at other locations where changes in source of supply have resulted in over-rating of primary gear necessitating costly replacement programs.

Plant Distribution System

Having obtained a reliable source of power, one must match this with a distribution system which will function with the power source in a coordinated manner. Added to the need for reliability is again the consideration of economics in inital cost and the final operation of the system. The cost of the system can be controlled to a great extent by the proper selection of circuit arrangement and equipment; however, any cost reduction at the expense of safety or serious curtailment of reliability is to be avoided. Basic require-

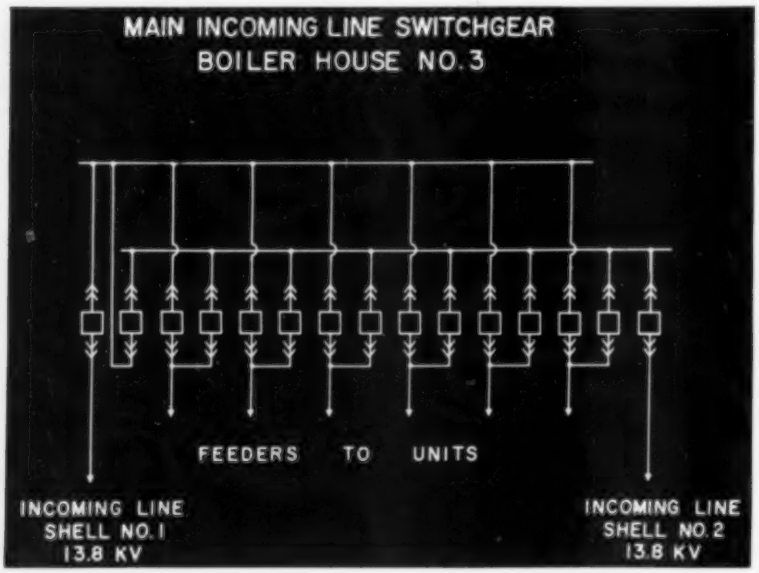


Fig. 2 — An example of how economies in initial capital expenditure must ever be a consideration in design. Double bus switch-gear was selected for reasons of flexibility in maintenance and other operating problems. But, at time of purchase, double bus unit did not meet construction schedule and initial cost was considerably in excess of standard single bus unit. As a final outcome, two single bus units, each having one main incoming line breaker and the required number of feeder breakers, were purchased.

ments then show that one must consider simplicity and reliability of operation, a definite flexibility for changes due to normal expansion, economy in initial costs, and low operating costs. The more specific points to be considered would be selection of **circuit arrangement, distribution voltage,** and **type of construction.**

Circuit Arrangement

Experience has evolved certain definite distribution arrangements. The three basic primary arrangements considered at Norco were the radial, the loop, and the primary selective radial, with the degree of service continuity and costs being in the same order as arrangements are listed, the radial system being the least expensive. The four basic secondary arrangements considered at Norco were the radial, low voltage selective, the spot network, and the network. Again the degree of service continuity are in the same order as the arrangements are listed, the radial being the least expensive.

At Norco, a modified or modern version of the older type radial system on both the primary and secondary was the arrangement selected. In general, one area substation was usually used for each major operating unit. This increased the number of primary feeders, but reduced the number of transformers on each feeder, thereby reducing and localizing the extent of the area affected in case of a fault. When this scheme is carried to this extent, the service reliability of this type of radial system approaches some of the more elaborate circuit arrangements but at a reduction in initial capital expenditures.

Distribution Voltage

The physical layout and load density pointed to the fact that a logical choice for the primary voltage would be 13.8 kv. However, the selection of 13.8 kv as the primary or distribution voltage presented one problem in this particular case, namely the integration of the old system with the new. This is a situation that frequently presents itself to the design engineers. Very rarely, if ever, in refinery expansion, do we have the opportunity of developing a completely new system without some integration with an existing system.—See Fig. 3.

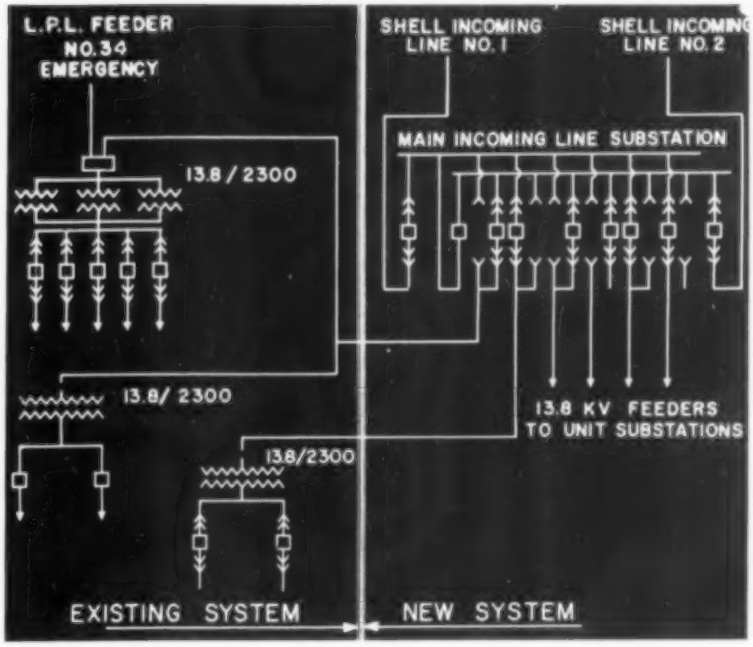


Fig. 3 — Very rarely, if ever, in refinery or process plan expansions, does the plant engineer have the opportunity of developing a completely new system, without integration with an existing system.

Prior to the recent expansion the older section of the refinery was served by a simple radial system in which the greater portion of the load was supplied from one substation. The voltage transformation from the delivery at 13.8 to 2.3 kv for distribution was made at this one location.

Growth of the refinery over a period of years had extended the circuits from this substation to the point that system losses were high and voltage regulation was poor. To raise the distribution voltage in all sections of the old

Fig. 4 — Operating experience, expressed in outages from lightning per 100 miles of line per year for 110 kv and 13 kv overhead lines. It is evident that much can be done to minimize lightning outages by the use of shielding systems and adequate insulation.

LINE CONSTRUCTION	OPERATING VOLTAGE 110 KV	OPERATING VOLTAGE 110 KV
UNSHIELDED 115 KV INSULATION	45	
UNSHIELDED 115 KV INSULATED ARRESTORS EVERY 2 1/2 STRUCTURES	20	
SHIELDED	1	
UNSHIELDED 13 KV INSULATION		250
SHIELDED, VARYING WITH TYPE OF CONSTRUCTION & SHIELDING		1/2 TO 8

Proper planning pays off . . .

The proof of how well the Norco refinery has accomplished its ultimate aims is furnished by actual operating experience over a period of years. System has been in operation for approximately 2½ years. Performance has been good and maintenance has been low.

There have been no complete outages of the source of supply. There have been a total of 13 voltage disturbances during this period which were not serious enough to trip motors equipped with time-delay undervoltage protection.

Each of these cases has been carefully studied in conjunction with engineers at Louisiana Power and Light Company, the refinery furnishing them a detailed report as to what happened in the refinery and they in turn furnishing the refinery information as to what caused the disturbance.

Approximately 75% of these disturbances were traced to weather conditions on one section of unshielded line in the Louisiana Power and Light system. This section of the line has since been shielded.

Within the refinery, in addition to fault on the aerial cable (discussed in article), there has been one other major outage due to a failure of a high-voltage bushing on a 13,800/480 volt transformer. This failure was due to a slight oil leak which was undetected, finally resulting in a flashover.

refinery would have resulted in costly replacement of transformer capacity. Therefore, in the final arrangement somewhat of a compromise was achieved, thus necessitating the following revisions:

(1) A primary voltage of 13.8 kv was selected for the distribution system in the new section of the refinery.

(2) The 2500 kva substation in the old section of the refinery was removed from the existing purchased power tie line and reconnected to the new incoming line substation.

(3) Two feeders from the new incoming line substation were extended into the old section of the refinery. Additional area substations were installed and load was transferred from the 2500 kva existing substations to the new area substations, thereby eliminating some of the voltage distribution difficulties in the old areas.

This by no means eliminated all of the existing problems in the old refinery areas; however, it did provide a sound base on which complete future rehabilitation of the system could proceed on a step-wise basis.

Type of Construction

The type of construction used in the distribution system must be given as much or more thought in planning as the circuit arrangement. Selection of improper equipment or poor construction methods can render ineffective the most elaborate circuit arrangement.

There are two types of systems in use in refineries or industrial plants, namely underground and overhead. The overhead circuits may be either open wire construction or aerial cable installations. The advantages and disadvantages of these types of construction are well known. With reference to an underground installation, which is probably the most widely used in refineries, particularly in operating areas, the greatest advantage is the protection afforded from faults due to weather conditions, from major fires, and other disturbances such as cranes and automotive equipment.

On the other hand, the disadvantages of underground systems are higher initial installation costs, and the time required to locate and effect repairs after faults even though faults are much less frequent than on overhead circuits.

The advantages of overhead construction are the low initial installation costs and the ease with which repairs can be effected in case of faults. The disadvantages are, of course, susceptibility of the system to weather conditions and other outside influences.

All of these factors were given careful consideration at Norco. No distribution system, when properly designed and installed, is inexpensive. As a rough comparison underground systems cost approximately four times as much as open-type overhead systems and aerial cable installations cost approximately twice as much as open-type construction.

In addition to the high initial cost of the underground system, this type of installation presented another problem at Norco. Due to the nature of the terrain in the refinery, with the water table never dropping below a depth of 30 in. even in the so-called "dry season," adequate drainage is sometimes difficult to achieve. Such a condition in combination with possible chemical contamination could prevent a serious problem from a corrosion standpoint.

With reference to the overhead type construction, weather phenomena cannot be ignored. The number of thunderstorm days per year in this area is approximately 75. Only one other area, the West Gulf Coast of Florida, having a total of 80-90 thunderstorm days per year is higher than this area. Furthermore, open-type feeders operating at 13.8 kv routed through operating areas were extremely undesirable and in some cases impractical.

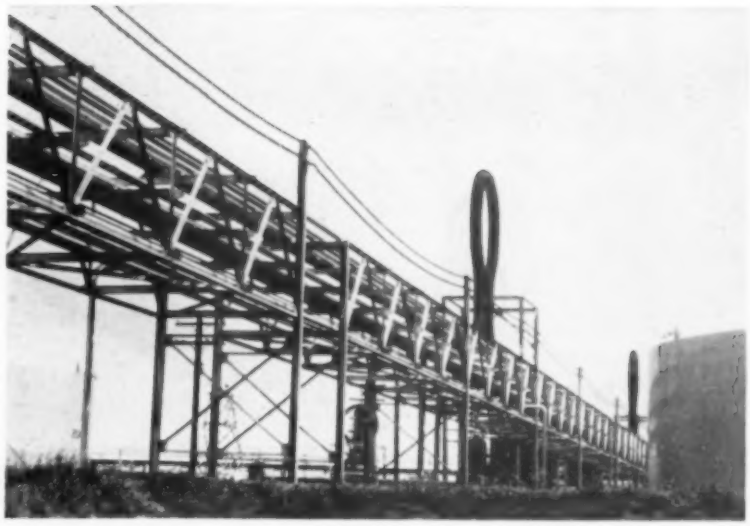
In the final analysis, two types of construction were actually used. Aerial cable was installed on all 13.8 kv primary circuits, and open-type construction with weatherproof wire was used on the short runs of 480 volts and 2300 volts in the tank yards and other noncongested areas. This represented somewhat of a compromise in initial costs, eliminated the undesirable features of the under-

ground system, and with proper design and engineering afforded the desired protection from weather conditions and other outside influences.

The aerial cable used in this installation was the pre-assembled, self-supporting type with three single conductors, insulated for 15 kv, bound to a copperweld in-built messenger by copper binding tape. Careful consideration was given to the physical location of these circuits with respect to tanks, furnaces, and other equipment that, under emergency conditions, could endanger the circuits. Not more than two primary feeders were allowed to follow the same route.

In order to eliminate the use of wood poles in operating areas, the process pipe racks were designed with special supports from which the aerial cables were suspended. As you might suspect, this provoked considerable discussion during the design stages, particularly with our Safety Department, since the possibility of interference from cranes and personnel working in the racks was recognized. It was believed that this hazard could be practically eliminated by suspending the cable above the top tier of the rack and on the rack side opposite the roadway from which the crane would be working.

Since this was the first aerial cable used in the refinery, there was no personnel trained in the installation and splicing of this type of conductor. Even before the system was placed in operation, training classes in splicing were inaugurated. The test splices were sent to the manufacturer for testing, for criticism and suggestions for improvement. Since this is also the first major cable installation in any of the Shell refineries, the performance has been observed with considerable interest. After being in operation two years on approximately three miles of aerial cable, one fault has been experienced, this being a failure in a splice of one conductor, phase to ground. After a careful study of the failure in conjunction with the cable manufacturer, the fault appeared to be the result of corona originating from the improper installation of the connector in the splice.



In order to eliminate use of wood poles in operating areas, process pipe racks were designed with special supports from which the aerial cables were suspended. Note that cable is suspended above top tier of the rack and on the rack side opposite roadway working area.

Substations & Switchgear

Power in the operating units is utilized at one of the following voltage levels:

Motors up to ½ hp—115 volts, single phase; Motors ½ hp to 75 hp—480 volts, 3 phase; Motors larger than 75 hp—2400 volts, 3 phase; and Lighting — 120/208 volts, 3 phase.

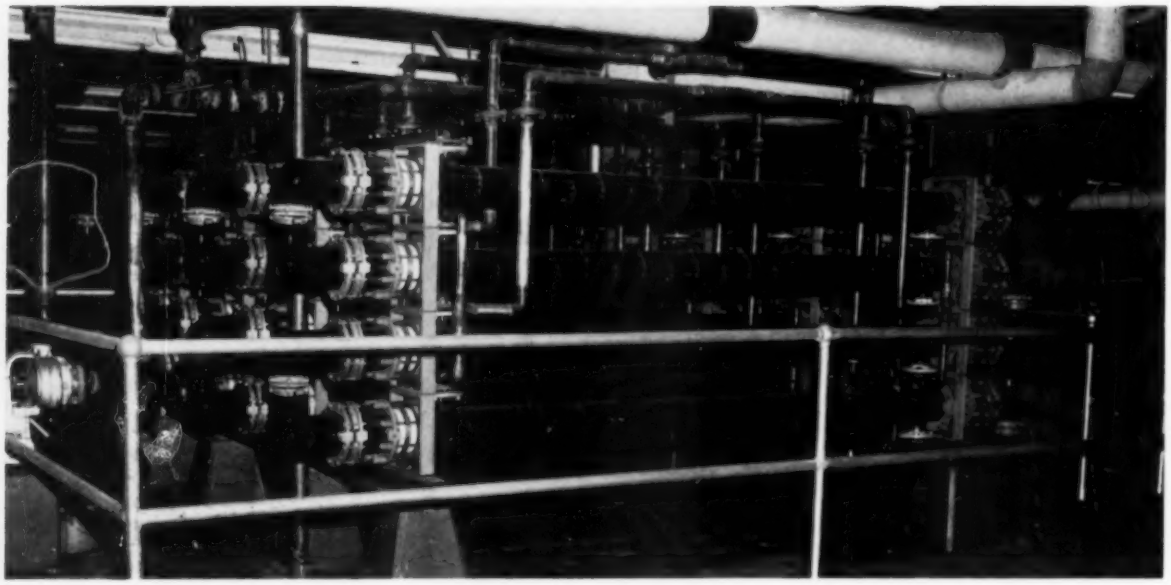
Each of these services is provided in area substations located adjacent but outside the plot limits of the operating units. Generally, one major operating unit was connected to one unit substation.

Outdoor metal clad switchgear was used throughout with the secondary of the three-phase transformer throat connected to the switchgear. The 2300 volt and 480 volt transformers are arranged for the future installation of fans if subsequent load increases should require it. As part of the installation the transformers were equipped with signal lights indicating high oil temperature. On the 2300 volt service, oil circuit breakers electrically operated are used in the secondary switchgear while on the 480 volt service air circuit breakers, manually operated were installed.

The feeders from the secondary breakers in the area substations were extended overhead in conduit on the process pipe racks to motor control centers located in the plot areas. For the most part these motor control centers are located outdoors in what we term "tropical shelters." Concentration of the motor starting equipment has proven to be sound from an economic and an engineering standpoint. Secondary runs have been kept as short as possible and every opportunity has been taken to concentrate power distribution centers as near the load as possible.

In the design and layout of the secondary system special attention has also been given to providing equipment with adequate short circuit interrupting capacity which can be properly coordinated completely through the system from the primary gear to the point of utilization.

Since it was anticipated that the loss of some motors might be experienced as a result of voltage disturbances during unsettled weather conditions, the starters in key motor installations were equipped with time-delay undervoltage protection. This permits these motors to ride through voltage surges which would otherwise result in a tripout.



Sixteen shell and tube heat exchangers at Sevier Plant make up the unique Pyrex installation. They are arranged four high and four wide. Fresh water flows through each of the glass shells, and takes on heat from the dye liquor which flows through 26 tubes inside each shell.

North Carolina Plant Reduces Peaks and Saves Heat With

GLASS HEAT EXCHANGERS

By A. KEITH POOSER
General Engineer
The American Thread Company

THE WORLD'S largest concentrated system of Pyrex heat exchangers was recently put into operation by The American Thread Company at its finishing plant in Sevier, North Carolina.

Changes Needed

When The American Thread Company moved its dyeing and finishing operation from Bristol, Tennessee, to their plant at Sevier it became apparent in the first winter of operations (1954-55) that something had to be done to relieve the high peak loads on the existing boilers. The first thought was the installation of a heat recovery system to pick up heat from the dye liquor waste and utilize it to raise the temperature of the incoming fresh water.

Detailed studies were then made to determine the average temperature of the dye waste, hot water loads, boiler loads and other information pertinent to the problem at hand. During the construction of the Sevier plant, daily temperatures of the raw water had been recorded for the period of one year. With this information at hand, investigation of various types of heat exchangers was made.

Corrosive Waste

Due to the corrosive nature of the dye waste, no metal exchanger was considered other than one made entirely of stainless steel. This naturally is quite expensive. Exchangers of the open-pit type were considered as well as the shell and tube exchanger. For the quantity of waste water available and the amount of fresh water to be heated, the open-pit type required an extremely large and deep concrete pit which presented drainage problems as well as a suitable location problem.

At this point the Pyrex glass heat exchanger came into the picture. A study of this type was made, and it finally proved to be the one that was installed. It was chosen because the corrosive product comes in contact with nothing but glass, Teflon and ceramics which means a minimum of maintenance. It is light and can be handled easily. It is easy to install and can be quickly removed and replaced, if necessary.

The glass tubes offer a resistance to the build-up of algae and scale, which often slows up the heat flow. The overall heat transfer is considered satisfactory, and easy visual inspection is an advantage in pin-pointing the location of a tube leak. The exchangers can be arranged in series so that

one unit can be removed for repair, and the remaining units can still operate.

Design Features

The installation at Sevier consists of 16 shell and tube exchangers, stacked four high and spaced in four groups horizontally, with the dye liquor making passes through the tubes of four units, and the fresh water making one pass through the shell of each unit. Each of the sixteen units has 26 tubes with an I.D. of .69 in. and an O.D. of .75 in., and an effective length of 9'10¼". Each group of 26 tubes has an external surface area of 50.3 and is known as a 50 sq ft unit. The tube wall conductivity coefficient K/1 = 260 btu/hr/ft²/degree F. Tubes can withstand a temperature of 375 F and a maximum pressure of 20 psi. The maximum recommended pressure and temperature of the 6" diameter shell is 20 psi and 200 F, respectively.

Fortunately, at Sevier, underfloor drain trenches were large enough to permit installation of a partition down the center of each trench to provide division between hot and cold water. This was accomplished by the installation of a special valve arrangement, devised by a member of the general engineering staff. The system discards any waste water below an uneconomical temperature on one side of the partition and saves the hotter waste on the other side where it is dammed up at a central collection point and pumped through the heat exchanger.

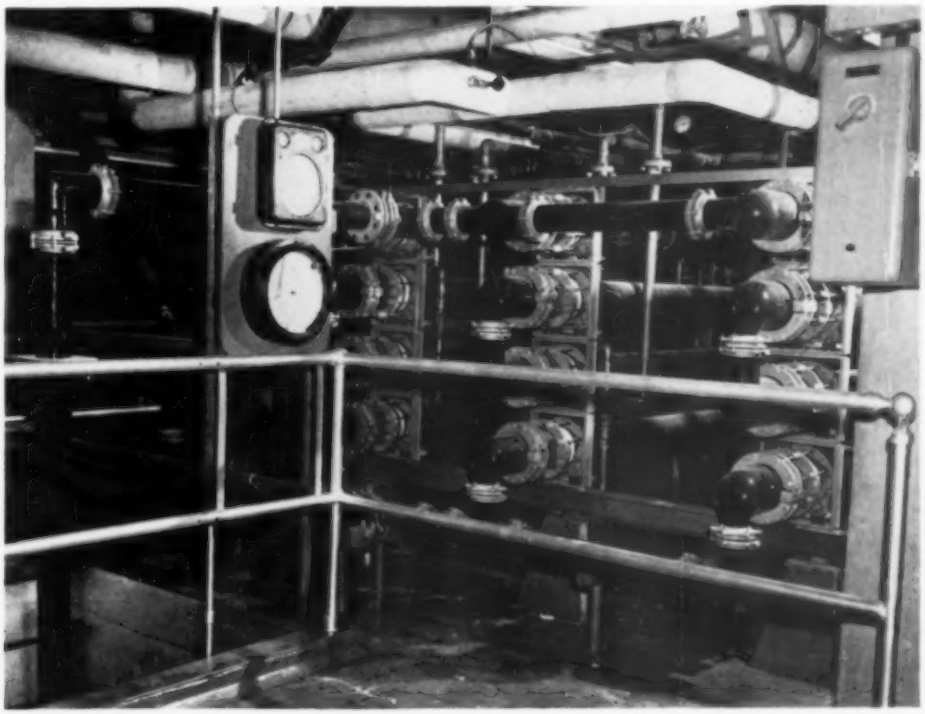
Based on the average annual fresh water temperature, the system was calculated to produce an average rise of 37 F, which will reduce the peak load on the boilers as well as cut down on fuel consumption. The overall saving on boiler capacity will vary considerably during the year, but it is figured to reduce the hot water heating load more than 36%.

While some industrial plants in this country and in Canada have more Pyrex heat exchanger units scattered around the plant in small groups, the installation at Sevier is the largest of its kind in the world concentrated in one system.

The system was designed by the Company's Engineering Staff and was erected by the Sevier Maintenance Department.

PRINCIPAL EQUIPMENT

Pyrex Glass Heat Exchangers: Size 50—Corning Glass Works
Waste Water Pump: Size 3" x 4", with contact surfaces of Gould-A-Loy 20, Figure 3715, 500 gpm —Gould Pumps, Inc.
Fresh Water Pump: Size 3" x 4", Figure 3755, 500 gpm — Gould Pumps, Inc.
Pressure Reducing Valve: 4" with air pilot operated pressure control—Fisher Governor Company
Waste Water Piping and Fittings: Pyrex Glass — Corning Glass Works, and stainless steel
Cold Water Piping and Fittings: Copper
Expansion Joints in Waste System: Teflon — Raybestos-Manhatten, Inc.
Trench Partitions: Chemstone Sheets—Johns-Manville
Partition Coating: Three coats Epoxy Paints — E. I. DuPont DeNemours & Co.
Instruments: Miscellaneous on hand
Waste Water Valves from Machines: Special Design — The American Thread Company



Front view shows 12 of 16 units with the instrument panel which measures temperature of fresh water as it leaves and also of the incoming and outgoing waste. The system is designed for self-operation.

Southern Company Uses Engine-Driven Generators for

Stand-By Station Service Supply

By HENRY B. COX
Principal Engineer
Southern Services, Inc.
Birmingham, Alabama

MODERN fuel fired electric power generating stations are usually designed so that each turbo-generator and its associated boiler, main power transformer, unit station service transformer, and all auxiliaries of this equipment operate as one power generating unit with no interconnection to other units.

Each independent power generating unit is connected to the high voltage power transmission system through one high tension oil circuit breaker. No low side of bank (or generator circuit breaker) is usually provided due to the large current and interrupting rating required. The unit station service transformer is connected to the associated low side of power transformer bank bus through disconnect switches.

Power for starting up the main station is provided from a special "Starting" station service transformer connected to the high voltage power transmission system. Normally only one starting station service transformer is required for a multi-unit power plant as each unit (after starting) is operated from its connected unit station service transformer.

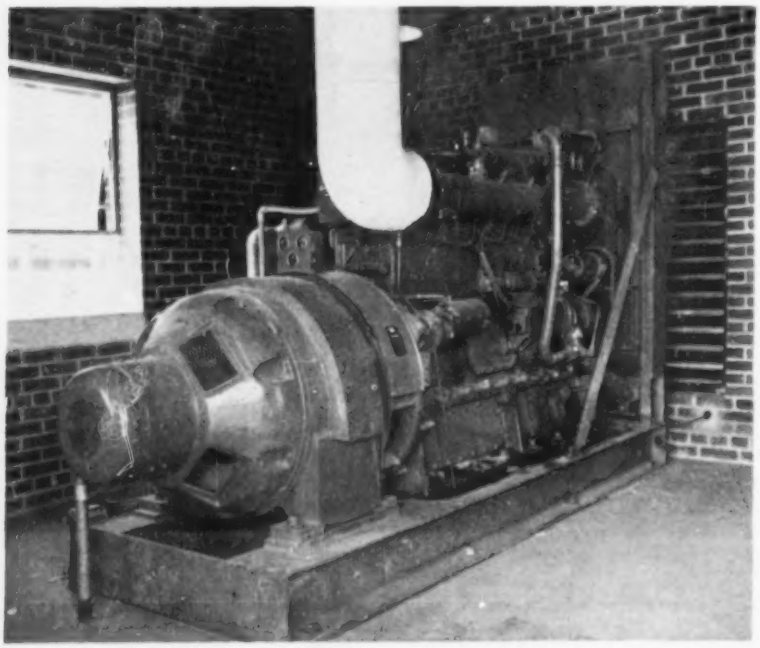
In emergencies, should the starting station service transformer not be available for service, a second unit may be started from a partially loaded unit already in service by using the starting station service bus to transmit unit station service power from the partially loaded unit to the unit being started.

Normal Supply

With all generating units in the station out of service, the power plant "Stand-by" station service requirements are low and are supplied from the high voltage power transmission system through the starting station service transformer. This power plant "Stand-by" station service is required for fuel handling, water pumping, elevators, machine shop, cranes, lighting, heating, ventilation, oil conditioning, air conditioning, communication, etc.

Stand-by power is also necessary to operate each turbo-generator rotor turning gear motor and turning gear oil pump, the generator hydrogen control equipment, and the station battery charging set. The turbine rotor must be rotated to keep it from bowing due to temperature gradients which exist especially in a unit which has just been shut down. The hydrogen control equipment, including the hydrogen seal oil pumps, must remain in service to prevent loss of hydrogen from the generator.

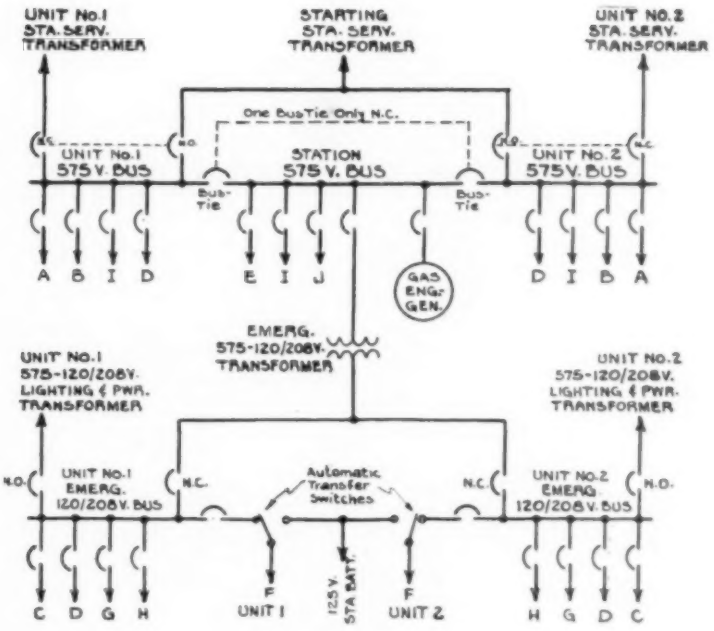
In generating stations with three or more units and several high voltage power transmission system tie lines there is little danger



This 150 kw, 600 volt gasoline engine-driven generator provides emergency stand-by power for the Plant Hammond generating station of the Georgia Power Company near Rome, Georgia.

The unit was installed with the first two 100,000 kw turbo-generators in the new generating station which at that time was connected to five power transmission lines. A third 100,000 kw turbo-generator and another power transmission line have been added and the 150 kw emergency stand-by power supply was not increased. By prompt reduction of water flow to the building sumps and proper sequential operation of the sump pumps, the 150 kw generator will supply emergency stand-by power for the three units.

When a fourth generating unit and additional power transmission lines are installed, the remote danger of losing station service supply probably would not justify the expenditure for additional emergency stand-by power generating equipment.



A-Turbo-generator Turning Gear Motors.
B-Turbo-generator Turning Gear Oil Pumps.
C-Turbine Oil Vapor Extractor Pumps.
D-Gen. Hydrogen Control Equipment Incl. Hyd. Seal Oil and Vacuum Pumps.
E-Station Battery Charging Set.
F-Emergency Lighting.
G-Communications Equip. Incl. Radio, P.A. System and Teletype.
H-Switchboard A.C. Controls and Chart Drives.
I-Building Sump Pumps.
J-Elevator.

Single line diagram for a typical emergency station serving a two-unit plant. Note that only emergency loads are shown.

of losing either "Starting" or "Stand-by" station service power supply since normally all units in the station would not be shut down simultaneously and in all probability power would be available from at least one of the several power transmission system tie lines. In new generating stations usually only one unit is installed initially with provision for plant extension to ultimate capacity. In most cases at least two high voltage power transmission tie lines are provided with the initial unit and other transmission tie lines are added as required when more units are installed.

Storm Protection

There is some danger of losing "Starting" and "Stand-by" station service power in stations with only one or two units and few power transmission lines. This is particularly true in the area along the Gulf Coast due to the possibility of damage to transmission and distribution lines from hurricanes. Also in areas 150 to 250 miles north of the Gulf Coast very infrequent severe sleet or icing conditions occur which disrupt the transmission and distribution lines in that area.

These conditions, in addition to the normal exposure to line damage from lightning and tornadoes or cyclones, justify a reasonable capital expenditure to insure availability of the power generating units when a connecting transmission line has been made ready for service.

In most cases "Starting" station service will be available from the restored transmission tie line on a large inter-connected system having many multi-unit fuel fired and hydro-electric generating stations, however minimum "Emergency Stand-by" station service is necessary, during the plant outage, to prevent long delays in restoring the units to service after "Starting" station service is available from the transmission system. This "Emergency Stand-by" station service load consists of the items listed below the single line diagram at left.

Engine — Generators

The "Emergency Stand-by" station service load per unit varies somewhat with the unit rating but the individual motor ratings and load values are such that they are normally operated from the 575 v and 120/208 v station service buses.

Standard gasoline or diesel engine-driven generator units of suitable rating to supply the "Emergency Stand-by" station service requirements are available. Several of these units have been installed in generating stations of the operating companies in the Southern Co. system.

Gasoline engine-driven sets have met the requirements so far and were selected because the plant personnel was already familiar with gas engine operation and maintenance, also in the lower capacity ratings gasoline engine-driven units require less capital investment. We have found that a typical generating station with two 75,000 kw capacity units requires one emergency 575 v generating set of approximately 100 kw capacity and a station with two 125,000 kw capacity units requires one of approximately 150 kw capacity.

For station insurance rate reasons these gasoline engine-driven generators are installed in a separate small building which is usually of steel frame and corrugated asbestos siding construction. In some cases, brick is used to match adjacent buildings. Space is also provided in this building for the gasoline engine-driven and motor-driven fire pumps.

The accompanying diagram shows a typical emergency station service single line arrangement for a two unit power generating station. Remote controls are provided on the station main switchboard for starting and operating

the gasoline engine-driven generator. Remote control load stripping switches are also included on the main switchboard to permit rapid tripping of all except the "Emergency Stand-by" station service loads from the respective 575 v station service buses. Since the "Emergency Stand-by" 120/208 v loads are normally supplied from a separate 575 - 120/208 v emergency transformer these loads are readily isolated for operation from the 575 v gasoline engine-driven generator.

Under emergency conditions, when all normal sources of station service power are out of service, the station operator strips the non-emergency loads from the "Station" 575 v bus then starts and connects the gasoline engine-driven generator to that bus thus restoring power to the "Station" 575 v bus emergency loads. The station operator then strips the non-emergency loads from each "Unit" 575 v bus and closes the respective bus tie breakers to restore power to each "Unit" 575 v bus emergency loads.

The installation of a gasoline engine-driven generator makes it possible to reduce the 125 v d-c station battery capacity. Providing Emergency a-c Power decreases the battery capacity requirements for operating the 125 v d-c emergency lights, emergency bearing oil pumps, and emergency hydrogen seal oil pumps.

Emergency engine-driven generators are usually installed in all new generating plants on the Southern Co. system.

Portable Filtering Device Handles Large Quantities of Insulating Oil

THE EXTENSIVE and continuing expansion of the Houston Lighting and Power Company has led to the installation of many power transformers and oil circuit breakers which are larger than any we have had before. Both the installation and maintenance of these larger units have presented problems in the handling of the insulating oil involved.

Larger quantities of oil must be removed from the unit before inspection can be made and larger quantities must be put in before the unit can be put in service. Normally the oil is in good condition or at most needs only a slight cleaning. The greatest danger lies in the possibility of contamination while handling and storing while inspection is being made.

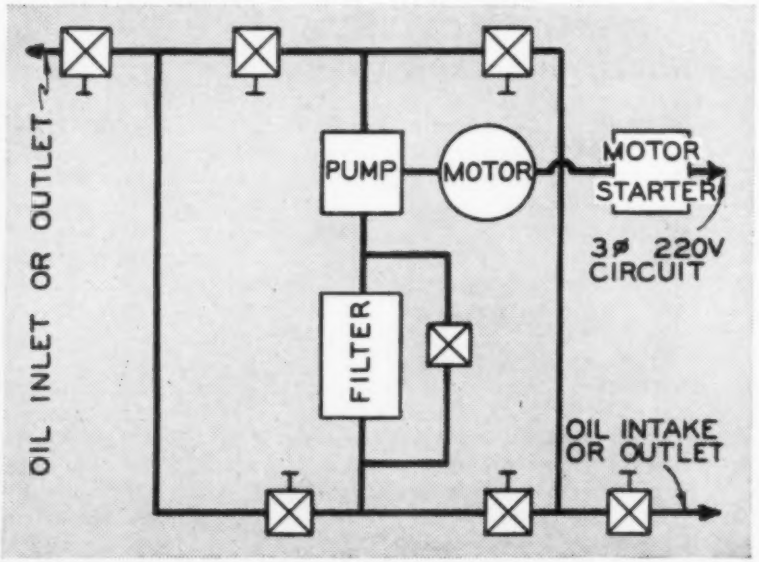
The problem became one of finding a relatively small, easily portable, device which would move oil in larger quantities than our filter presses. Also, it must insure that contaminations due to service and handling have been removed from the oil before restoring it in the unit being inspected.

To date we have settled on the Fram Liquid Separator Filter Space-Saver Unit — Model FCS-211-43 as the filtering device with a Viking Model ZAS pump driven by a 2 hp, 3 phase, 220 volt motor.

The equipment is capable of removing solid contaminants and moisture from the oil and moving it at about 25 gpm. Since this speed is about 3 times that of our blotter press filters we affect a great saving in man-hours per inspection. We purchased the items separately and assembled them in our shop using 1¼" globe valves and pipe for oil control. The enclosed sketch shows the essential parts and the oil circuit.

This whole device is mounted on two wheels whose axle is supported by the channel on which filter and pump are mounted. Dimensions are: width—34 in., height—42 in., length—45 in. Unit is easily handled on the ground and portable on a ½ ton pickup.

We use the Fram Space-Saver in cases where the time involved in handling oil is an item. For small OCB's and small TCUL contact compartments we use the blotter press filters. The unit described is not designed to rehabilitate bad oil since our practice on bad oil is to change it out and bring it into the shop for purification. It does clear up normal contamination and insures us of clean oil in large quantities when oil is handled on new construction.



By R. L. EVANS, Superintendent, Substation Maintenance Dept., Houston Lighting & Power Company, Houston, Texas.

Warmest Wishes for a Merry Christmas

EASTERN GAS AND FUEL ASSOCIATES

BEACON COAL

EASTERN GAS AND FUEL ASSOCIATES

PITTSBURGH BOSTON CLEVELAND DETROIT NEW YORK NORFOLK PHILADELPHIA SYRACUSE

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15,000
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MANZEL LUBRICATORS assure positive force feed lubrication for the protection of your valuable machinery. There's a model just right for your needs. Our field engineers are available for consultation.
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Research in Air Pollution

GROWING nationwide concern over the problems of air pollution is reflected in a new report on current research in the field recently issued by The American Society of Mechanical Engineers. The report, designed as an aid to engineers, public health officers, scientists, and others interested in air pollution problems, shows that 68 colleges, universities and research institutes now report that they are carrying on research in air pollution. The comparable number was 45 in 1955 and 37 in 1953.

Research projects described in the booklet include efforts to control impurities in automobile exhausts, development of various instruments useful in sampling and analyzing various atmospheres, measurements and analysis of dust and other impurities in the air, the influence of smog or infections in plants and animals, including humans, and related topics.

According to Frederick S. Mallette, Secretary of the Committee on Air Pollution Controls of the ASME, the current report is the second in a series of three scheduled for publication this year. The first, published in July, provided a list of instruments and devices useful in the study of air pollution. The third will deal with air pollution control equipment of all kinds. A monthly newsletter, "Smog News," is also being published by the committee.

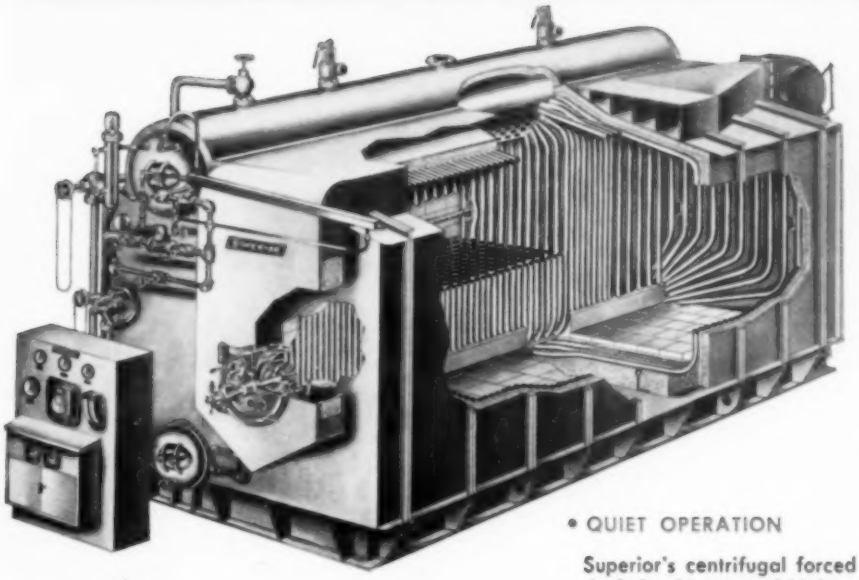
The current report, titled, "Guide to Research In Air Pollution," may be obtained at a cost of $1.50 per copy by writing to Order Department, The American Society of Mechanical Engineers, 29 West 39th St., New York 18, New York.

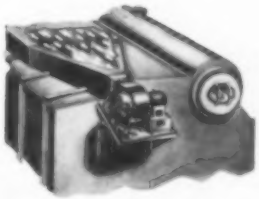
Readers Service Card

See Page 17

A true packaged boiler with capacities to 50,000 lbs. per hour . . . completely factory assembled . . . with plus features not commonly found on other packages.

All that a Water Tube Package SHOULD be PLUS



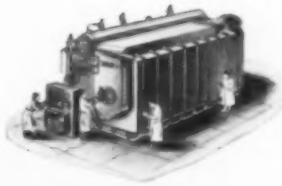


• QUIET OPERATION

Superior's centrifugal forced draft fan is mounted high at the rear of the boiler to provide quiet operation and an uncluttered firing front. Over-the-furnace air duct cools the furnace roof and provides better air distribution to the burner.

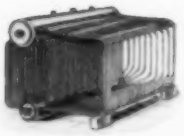
• AIR-COOLED OBSERVATION PORTS

An exclusive Superior Feature which utilizes air from the forced draft fan to provide a cooling shield at the observation ports, eliminates the danger of observing a fire in a pressurized furnace through an open port.



• FIRE TESTED

A distinct advantage of this truly packaged unit is factory fire-testing. Every Superior Steam Generator must achieve its guaranteed performance rating before shipment.



• TANGENT TUBES IN LARGE FURNACE

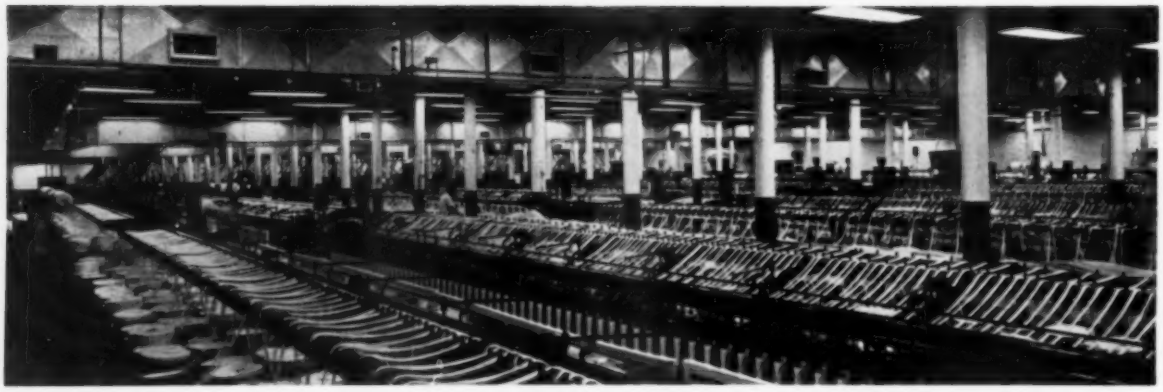
Released heat in the furnace is quickly absorbed in the tangent tubes, which are all riser elements providing rapid circulation and discharge directly into the steam drum.

There's no guesswork about Superior Steam Generators. They are designed, engineered, built and tested by Superior Combustion Industries, Inc. whose boiler division specializes in the exclusive manufacture of packaged steam generators. For complete details write today for Catalog 811-D

Specialists in PACKAGED BOILERS . . . exclusively

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR STEAM GENERATORS



Air washers, supplied with chilled water, provide clean, filtered air to spinning department.

Clean Air Saves Money for North Carolina Textile Mill

Chilled Water and Air Washers Get Results

THE PROBLEM—No matter how carefully the yarn was spun, it was difficult to keep it clean at the Highland Park Manufacturing Company, Charlotte, N. C. The answer — 322 tons of Trane air conditioning equipment for a central-station refrigeration and air cleaning system for the textile mill.

For years soot- and smoke-laden air lowered quality in the carding and spinning departments of the mill, located in a highly industrialized area of Charlotte. During hot summer months employee absenteeism was above normal; and in winter, yarn, machinery, floor, and walls were subjected to carbon and tar deposits carried into the building by dirty air.

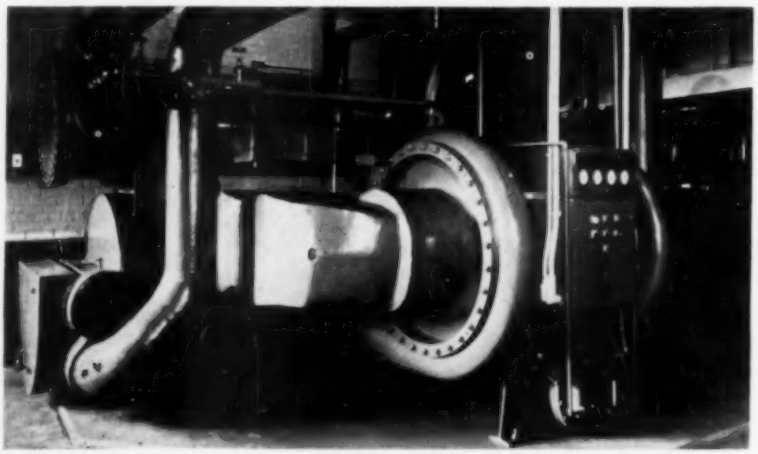
The installation of the refrigeration system, which supplies chilled water to air washers in both the carding and spinning departments turned the trick. Located in the basement of the mill, the Trane CenTraVac water chiller sends 1000 gallons of water per minute at 46.6 F to the air washers. The chilled water is pumped to the air washers in the two rooms through insulated supply and return piping.

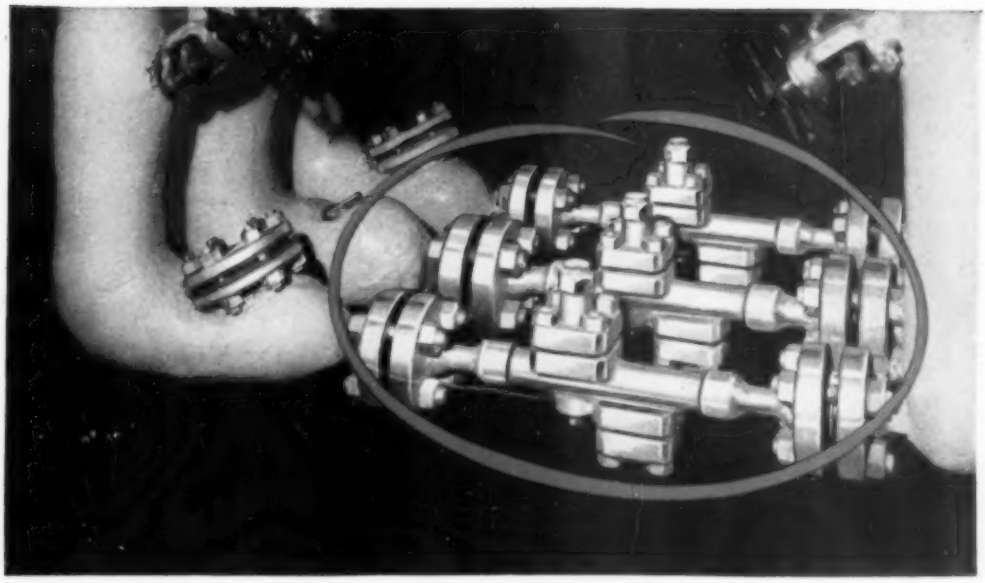
Water supply to the chiller comes from a redwood, induced draft cooling tower. The tower provides 963 gallons of water per minute, cooling it from 95 F to 85 F when the outside air wet-bulb reading is 78 degrees.

A centrifugal fan with a maximum air volume capacity of 18,200 cubic feet per minute supplies the card room with 13,800 cubic feet of air per minute. From the spinning room, 60,000 cubic feet of air is supplied from the system which is capable of a maximum air delivery of 90,000 cubic feet per minute.

Temperature control the year around is kept at 80 F dry-bulb and 50 per cent relative humidity when the outside temperature is 90 F with a wet-bulb reading of 78 F. This keeps the hundreds of mill employees comfortable and on the job during hot spells, while the filtered, washed air is providing lower maintenance costs, improved yarn quality, and fewer undesirable seconds occur.

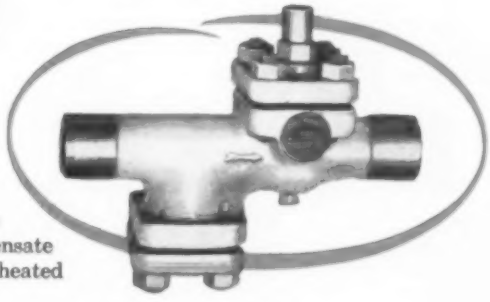
Centrifugal unit supplies 322 tons refrigeration for carding and spinning





Three Yarway Integral-Strainer Impulse Traps draining main steam lines in large mid-west power plant. Other Yarway traps drain extraction lines in same plant. Yarway Integral-Strainer Impulse Traps are available with welding or flanged connections. Pressures 600, 1500 and 2500 psi.

HIGH STEAM PRESSURES AND TEMPERATURES CALL FOR YARWAY INTEGRAL-STRAINER STEAM TRAPS



YARWAY Integral-Strainer Impulse Steam Traps drain some of the hottest steam lines in the country—temperatures up to 1000° F and pressures as high as 2500 psi.

When system is being warmed up these traps have ample capacity, yet will handle relatively small amounts of condensate without losing prime . . . and in the presence of dry or superheated steam, the trap valve snaps shut.

Leading utilities and other high pressure steam plants appreciate the other YARWAY advantages, too, such as *small size, light weight, steel construction, easy maintenance.*

For complete description write for Bulletin T-1740.

YARNALL-WARING COMPANY • *Home Office:* 116 Mermaid Avenue, Philadelphia 18, Pa.
Southern Representative: ROGER A. MARTIN, Bona Allen Building, Atlanta 3, Ga.

THERE'S A YARWAY IMPULSE STEAM TRAP FOR EVERY TRAPPING NEED

SERIES 60 and 120

For all *normal* trap requirements, pressures to 400 and 600 psi.

½" No. 20-A

For *light loads* on tracer lines, steam mains, small presses, etc.

SERIES 40

For *heavy loads* requiring extra high capacity steam traps.

INTEGRAL-STRAINER HIGH PRESSURE TRAP

For *high pressures, high temperatures.* (Flanged or welding connections.)

YARWAY IMPULSE® STEAM TRAP

OVER 1,000,000 YARWAY IMPULSE STEAM TRAPS USED

POWER SHOW

New York City's brand new modern Coliseum at Columbus Circle will be the location of the **22nd National Exposition of Power and Mechanical Engineering.** The exposition continues under the auspices of The American Society of Mechanical Engineers and will be simultaneous with the Society's 76th annual meeting.

THE POWER SHOW will scan the entire panorama of materials and equipment for the production, distribution and application of power, together with power uses in mechanical engineering. Over 300 exhibits will cover the generation and utilization of power and steam.

As in previous years, the exposition will be open to visitors by invitation and registration only. The general public will not be admitted. E. K. Stevens, president of the International Exposition Co., is Power Show manager.

Exhibit Highlight Data

Equipment for the production and use of steam will constitute a large proportion of the exhibits at the Coliseum, for the reason that steam is universally employed in power production and in many and varied operations employed by all manner of industries. There will be a comprehensive display of package boilers, as well as components for high-power steam generators, which are individually designed. Steam engines, turbines and turbo-generators will represent the field of prime movers.

Components used in steam generation will include: burners, refractories, insulation, sludge solvents, dust control apparatus, gas scrubbers, tubing, pipe and pipe fittings and supports, flexible and expansion joints, seals and packings, valves and valve controls, traps, pumps, fans and blowers, among others. Many exhibitors will offer equipment and supplies for installation and maintenance of plants, such as packing and gaskets, tube expanders and cleaners, gas analyzers, gages and indicating instruments of many kinds.

The exposition will make news in its newest feature, the atomic section, which is expected to produce striking disclosures among the widening applications of nuclear physics.

Electrical equipment will be strongly represented, not only in power units, such as a variety of motors and motor drives, but in supplementary applications in factory and field. There will be displays of cable testers, dielectric testing and cabel fault locating equipment, ac-dc converters, frequency changers and testing equipment, variable speed drives, diesel generating sets, and others.

The newest equipment for over-potential testing will be exhibited. A large public utility recently purchased a set of this equipment and afterward testified that in one test, the saving over previous methods had justified the cost, which was $30,000.

Electrically powered equipment for efficient automation will be offered in a compact, variable speed drive having wide range and fine regulation. At the same display will be shown a motor-generator set with ac and dc controls, mounted in a pressurized, self-ventilating steel cabinet.

In the field of materials there will be, among other exhibits, new varieties in clad steels and many new special purpose alloys, self-lubricating bearings and powder metal parts, metalizing equipment, metal cutting tools, spring coilers and torque testers, welding rods and equipment, protective coatings.

A new line of duct is composed of fiberglass impregnated with neoprene or silicone, and reinforced with wire. It is capable of withstanding temperatures from —65 to +600F. Produced in a range of 1 in. to 12 in. I D, it is widely used in aircraft applications, as well as industrial uses.

An entirely new expansion joint

has been designed to eliminate the use of highly stressed, thin-wall corrugated bellows in piping systems.

Termed the first hydraulic bolt tentioner, providing the fastest method for securing uniform pressure control on gaskets, will also be exhibited for the first time.

Water saving in industrial cooling, with temperature controlled to within 2 deg F, is offered in the new Panel Casing Aero Heat Exchanger, an evaporation apparatus which maintains the required thermal level by the modulated use of outdoor air.

One of the most novel displays at the exposition will be the Guide-O-Matic industrial tractor, which safely threads the aisles of an industrial plant with several trailer loads of material in tow, without an operator at the steering wheel. Control of the train is effected by electronic signals, communicated to a receiver on the tractor from a guidance wire. The tractor operates at 3 to 6 miles per hour, and is equipped with hand controls, for conventional battery-operated tractor operation when required.

ASME ANNUAL MEETING

With "Free Exchange of Knowledge—the Path to the Future" as the keynote, plans for the 1956 Annual Meeting of The American Society of Mechanical Engineers, to be held November 25-30, at the Statler and the Sheraton-McAlpine Hotels, New York, N. Y., are well launched. More than 100 technical sessions are scheduled on the five-day program which offers a vast variety of activities to those who will attend the technical as well as the general sessions, the social events, and the inspection trips.

INSPECTION TRIPS

The Inspection Trips Committee announced the following tentative list of inspection trips:

Monday, November 26: Chas. Pfizer Company, Inc., manufacturers of pharmaceuticals.

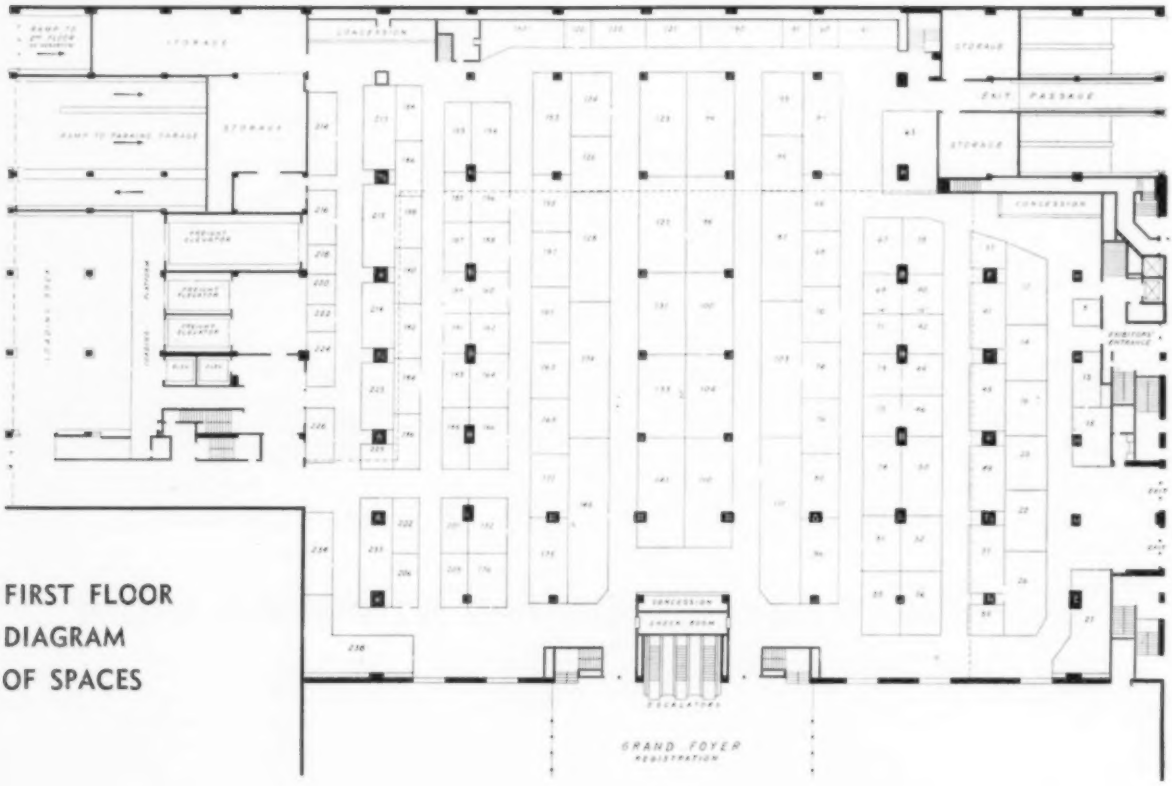
Tuesday, November 27: Consolidated Edison Company of New York Astoria generating plant, and/or Air Cargo Terminal at New York International Airport.

Wednesday, November 28: Ford Motor Company, Mahwah, N. J., and/or American Export Lines USS *Constitution*.

Thursday, November 29: Lincoln Tunnel third tube, presently under construction, and/or Medallic Art Company, manufacturers of emblems, medals, plaques, and so on.

MANUFACTURERS EXHIBITING AT POWER SHOW

Exhibitor	Booth No.
A	
ASME Mechanical Catalog and Directory, 29 West 39th St., New York 18, N. Y.	586
Abrams, Inc., Morris, 90 Hudson St., New York 13, N. Y.	215
Adsco Industries, Inc., 20 Milburn St., Buffalo 12, N. Y.	595
Aerco Corporation, Paris Ave., P. O. Box 248, Northvale, N. J.	591
Aerojet-General Corporation, Azusa, California	744
Airetool Mfg. Co., The, Springfield, Ohio	491
Alco Products, Incorporated, Schenectady 5, N. Y.	725
ALLEN-BRADLEY CO., 136 W. Greenfield Ave., Milwaukee 4, Wisconsin	134
ALLIS-CHALMERS MANUFACTURING CO., Box 512, Milwaukee 1, Wisconsin	476, 482, 531
Allis Company, The Louis, Milwaukee 7, Wisconsin	127
Aloris Tool Company, 131-37 Sanford Ave., Flushing, L. I., N. Y.	218
AMERICAN BRASS COMPANY, THE Waterbury 88, Conn.	516-520
American-Marsh Pumps, Inc., Battle Creek, Michigan	590
American Pullmax Company, Inc., 2455 N. Sheffield Ave., Chicago 14, Ill.	220
American Rocket Society, 500 Fifth Ave., New York 36, N. Y.	686
American Society of Mechanical Engineers, The, 29 West 39th St., New York 18, N. Y.	586
American Turbine Corporation, 52 William St., New York 5, N. Y.	731
Anchor Packing Company, The, 401 North Broad St., Philadelphia 8, Pa.	95
Anderson Co., The V. D., Div. of International Basic Economy Corp., 1935 W. 96th St., Cleveland 2, Ohio	435
Andrews-Knapp Construction Company, Inc., 23-15 Borden Ave., LIC 1, N. Y.	716
Argon National Laboratory, Box 299, Lemont, Ill.	717
ARMSTRONG MACHINE WORKS, Three Rivers, Michigan	382
ARMSTRONG STEAM TRAP COMPANY, Three Rivers, Michigan	382
Ashton Valve Company, The, 43 Kendrick St., Wrentham, Mass.	663
Atlantic Transmission & Gear Sales Inc., 200 Lafayette St., New York 12, N. Y.	623
Atlas Valve Company, 280 South St., Newark 5, N. J.	660
Automatic Switch Company, 391 Lakeside Ave., Orange, N. J.	157
B	
BABCOCK & WILCOX COMPANY, THE, Tubular Products Division Beaver Falls, Pa.	420, 422
Badger Manufacturing Company, 239 Bent St., Cambridge 41, Mass.	160
BAILEY METER COMPANY, 1050 Ivanhoe Road, Cleveland 10, Ohio	515, 519
Baldwin Belting, Inc., 483 Washington St., New York 13, N. Y.	121
Banning, A. G., Jr., Route 208, Monroe, N. Y.	223
Barco Manufacturing Company, 500-530 No. Hough St., Barrington, Ill.	416
Barkelew Electric Manufacturing Co., Middletown, Ohio	192
Barrett-Cravens Company, 630 Dundee Road, Northbrook, Ill.	103
Bart-Messing Corporation, 155 Manchester Place, Newark, N. J.	496
Beckman, Inc., Arnold O., 1020 Mission St., South Pasadena, Calif.	659
Beemer Engineering Company, 401 North Broad St., Philadelphia 8, Pa.	622
BELCO INDUSTRIAL EQUIPMENT DIVISION, 52 Iowa Ave., Paterson 3, N. J.	626
Bendix Products Division, Missile Section, Bendix Aviation Corp., Mishawaka, Ind.	693
Bergen Pipesupport Corporation, 50 Church St., New York 7, N. Y.	563
Beta Electric Corp., 333 East 103rd St., New York 29, N. Y.	373
Biach Industries, Inc., 10 Indian Spring Road, Cranford, N. J.	664
Biddle Co., James G., 1316 Arch St., Philadelphia 7, Pa.	122
Black, Sivalls & Bryson, Inc., 7500 E. Twelfth St., Kansas City 26, Mo.	456



FIRST FLOOR DIAGRAM OF SPACES

Exhibitor	Booth No.
Bolenz & Schafer, Route 2-S, Monroe, N. Y.	223
Boston Gear Works, Quincy 71, Mass.	51
Bragar Company, Inc., Norman, 1060 Broad St., Newark 2, N. J.	395
BRAMMER CORPORATION, 684 Broadway, New York 12, N. Y.	541
Brooks Rotameter Company, P. O. Box 432, Lansdale, Pa.	388 & 390
Brown Fintube Company, Elyria, Ohio	86
Bruning Company, Inc., Charles, Chicago 41, Ill.	489
BYERS COMPANY, A. M., Clark Bldg., Pittsburgh, Pa.	202
BYRON JACKSON PUMPS, INC., 2301 E. Vernon Ave., Los Angeles, Calif.	726

C

Cambridge Instrument Company, Inc., Grand Central Terminal Bldg., New York 17, N. Y.	471, 473
CAREY MANUFACTURING COMPANY, THE PHILIP, Lockland, Cincinnati 15, Ohio	55
Carlson Company, The, 277 Broadway, New York 7, N. Y.	216
Carpenter and Paterson, Inc., 18 Hurley St., Cambridge 41, Mass.	617
Chemiquip Company, 463 West Broadway, New York 12, N. Y.	619
Chiksan Company, Brea, Calif.	68
Clark Controller Company, The, 1146 East 152nd St., Cleveland 10, Ohio	175
CLEAVER-BROOKS COMPANY, 326 E. Keefe Ave., Milwaukee 12, Wisc.	110
Cleveland Worm and Gear Company, The, 3249 East 80th St., Cleveland 4, Ohio	131
Cobra Metal Hose Division, D. K. Manufacturing Company, 4640 West 54th St., Chicago 32, Illinois	643
COCHRANE CORPORATION, 17th St. below Allegheny Ave., Philadelphia 32, Pa.	426, 428
Collins Machinery Corporation, 5474 Alhambra Ave., Los Angeles 32, Calif.	121A
Combustion Control Division, Electronics Corp. of America, Cambridge, Mass.	45
Commander Manufacturing Company, 4225 W. Kinzie St., Chicago 24, Ill.	215
Conax Corporation, 7311 Sheridan Drive, Buffalo, N. Y.	395
Continental Automatic Boilers, Phoenixville, Pa.	636
Continental Electric Equipment Co., 235 West 4th St., Cincinnati 2, Ohio	645
Conway Clutch Co., 2745 Colerain Ave., Cincinnati 25, Ohio	541
Cooper Development Corporation, 2626 South Peck Road, Monrovia, Calif.	688
Crosby Steam Gage & Valve Company, 43 Kendrick St., Wrentham, Mass.	663
CYCLOTHERM DIVISION, NATIONAL-U. S. RADIATOR CORP., 157 East 1st St., Oswego, N. Y.	506

D

DAMPNEY COMPANY, THE, Hyde Park, Boston 36, Mass.	470
Dayton Rubber Company, The, Dayton 7, Ohio	74
Dean and Benson Research Inc., 16 Richmond St., Clifton, N. J.	737
Dearborn Chemical Company, Merchandise Mart Plaza, Chicago 54, Ill.	644
Delta Equipment Company, 148 North 3rd St., Philadelphia, Pa.	215
Diamond Expansion Bolt Co., Inc., Garwood, N. J.	190
Diehl Manufacturing Company, Finderne Plant, Somerville, N. J.	93
DoALL Eastern Company, Inc., 36-06 48th Ave., Long Island City 1, N. Y.	187

SECOND FLOOR DIAGRAM OF SPACES

Exhibitor	Booth No.
DoALL New Jersey Co. Inc., 88 Park Ave., Nutley, N. J.	187
Dow Chemical Company, The, Midland, Michigan	746
Dowell Incorporated, P. O. Box 536, Tulsa 1, Oklahoma	396
Drive-All Manufacturing Co., 3400 Conner Ave., Detroit, Michigan	541
Dumore Company, The, 14th and Racine Streets, Racine, Wisconsin	215
Durabla Manufacturing Company, 114 Liberty St., New York 6, N. Y.	385

E

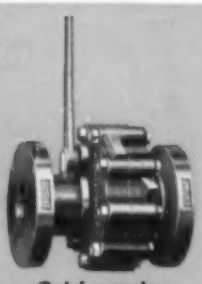
E-I-M Company, Inc., 1340 Old Spanish Trail, Houston 25, Texas	155
Eagle Signal Corporation, Moline, Ill.	194
Easco Products Division, Electro Arc Sales Co., P. O. Box 587, Ypsilanti, Michigan	219
Edison, Incorporated, Thomas A., Instrument Div., West Orange, N. J.	424
Electric Controller & Mfg. Co., The, Division of Square D Company, 4500 Lee Road, Cleveland 28, Ohio	635
Electrical World, 330 West 42nd St., New York 36, N. Y.	91
Electro Arc Manufacturing Company, Ann Arbor, Mich.	219
Electro Dynamic Division of General Dynamics Corporation, Bayonne, N. J.	162
Electronics Corp. of America, Combustion Control Division, Cambridge, Mass.	45
Elliott Manufacturing Company, 350 State St., Binghamton, N. Y.	189
ELLISON DRAFT GAGE CO. INC., 548 West Monroe St., Chicago, Ill.	362
Equipment Engineering Co., 2853 Columbus Avenue, Minneapolis, Minn.	541
Equipto Division, Aurora Equipment Company, Aurora, Ill.	699, 671
EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172nd St., Flushing 58, N. Y.	214

F

FAIRBANKS, MORSE & CO., 600 South Michigan Ave., Chicago 5, Ill.	111
Farval Corporation, The, 3249 East 80th St., Cleveland 4, Ohio	131
Federal Pacific Electric Company, 50 Paris St., Newark 1, N. J.	677
Fee & Mason Mfg. Co., Inc., Manasquan, N. J.	463
Fenway Machine Company, Edgemont & Clementine Streets, Philadelphia, Pa.	219
Ferguson Co., Harry J., 115 West Ave., Jenkintown, Pa.	542
Finn & Company Inc., T. R., Finn Aeronautical Div., 275 Goffle Road, Hawthorne, N. J.	745
Flexonics Corporation, Maywood, Ill.	609

Combine them

any way you choose for your boiler blow-off



Quick-opening

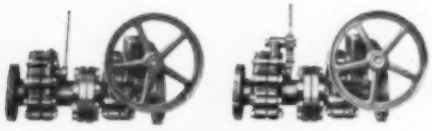
Slow-opening Angle Type

Slow-opening Y Type

Straightway and Angle Duplex Units

Straightway and Y Duplex Units

Angle and Y Duplex Units



Straightway Duplex Units

More than a dozen different arrangements of valve designs and operating methods are available to you in the complete Everlasting line of boiler blow-off valves for operating pressures up to 600 psi. Here is a range of selection from which you can get exactly the combination you wish.

For half a century, Everlasting Valve designs have been proving their effectiveness, reliability and durability—the kind of service you need for boiler blow-off. Each design fully meets ASME Code requirements. **WRITE FOR BULLETIN**

For "everlasting" service, use

EVERLASTING *Valves*

EVERLASTING VALVE CO.
53 FISK STREET, JERSEY CITY 5, N. J.

EV384

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SP&I presents each month helpful features, ideas, methods and procedures — many plant-tested in Southern and Southwestern industrial, power and service plants.

Send your ideas, methods and short-cuts to Southern Power & Industry. Payment is made for suitable material — a photo or rough sketch will make your idea more valuable.

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Southern Power & Industry
806 Peachtree St., N.E.
Atlanta 8, Georgia

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Foley Manufacturing Company, 3300 Fifth St., N. E., Minneapolis 18, Minn.	226
Foote Bros. Gear and Machine Corporation, 4545 So. Western Blvd., Chicago 9, Ill.	295
Foster Company, Benjamin, 4635-37 W. Girard Ave., Philadelphia 31, Pa.	389
FOSTER ENGINEERING COMPANY, 835 Lehigh Ave., Union, N. J.	431
Foxboro Company, The, Foxboro, Mass.	406
Furnas Electric Company, Batavia, Ill.	196

G

GARLOCK PACKING COMPANY, THE, Palmyra, N. Y.	475, 477
Gems Co., Newington, Conn.	361
General Controls Co., 801 Allen Ave., Glendale 1, Calif.	646
General Dynamics Corporation, Electro Dynamic Division, Bayonne, N. J.	162
GENERAL ELECTRIC COMPANY, D. C. MOTOR & GENERATOR DEPARTMENT, Erie, Pa.	510
General Fireproofing Co., The, Youngstown 1, Ohio	124
General Refractories Company, 1520 Locust St., Philadelphia 2, Pa.	172
Globe-Cleveland Manufacturing Co., 15209 Detroit Ave., Cleveland 7, Ohio	370
Globe Company, The, Grip-Strut Div., 4000 So. Princeton Ave., Chicago 9, Ill.	66
Gordon Company, James T., Woolworth Bldg., New York 7, N. Y.	131
Grand Central Rocket Co., Box 111, Redlands, Calif.	689, 691
GRAVER WATER CONDITIONING CO., DIV. OF GRAVER TANK & MFG. CO., INC., 216 West 14th St., New York 11, N. Y.	466
Green Fuel Economizer Co. Inc., The, 700 Main St., Beacon, N. Y.	100
GRINNELL COMPANY, INC., Providence 1, R. I.	485
GULF OIL CORPORATION, Gulf Bldg., Pittsburgh 30, Pa.	381

H

Harbison-Walker Refractories Company, Farmers Bank Bldg., Pittsburgh 22, Pa.	386
Harman Associates, F. Ward, Halesite, L. I., N. Y.	592
Hartford Electric Light Company, The, 266 Pearl St., Hartford 15, Conn.	233
Haveg Corporation, 900 Greenbank Road, Wilmington 8, Del.	713
Healy-Ruff Co., 2255 University Avenue, St. Paul 14, Minn.	361
Hewitt-Robins Incorporated, 666 Glenbrook Road (Glenbrook P. O.), Stamford, Conn.	141
Hobart Brothers Company, The, Hobart Square, Troy, Ohio	546
Hope Electrical Products Co., Inc., 39 Long Ave., Hillside, N. J.	395
Howe Scale Company, The, Rutland, Vermont	166
Hudson Basic Machinery Corp., 36-06 48th Ave., Long Island City, N. Y.	188
Hughes Aircraft Co., Station 101, Culver City, Calif.	690
Hungerford & Terry, Inc., 226 Atlantic Ave., Clayton, N. J.	599

I

Industrial Equipment News, 461 Eighth Ave., New York 1, N. Y.	46
Industrial Press, The, 93 Worth St., New York 13, N. Y.	37
Industrial Products Engineering Company, 26-40 Jackson Ave., L. I. C. 1, N. Y.	572
Industry Power, Commercial Bank Building, St. Joseph, Michigan	423, 425
Insulating Concrete Corporation, 7910 Wisconsin Ave., P. O. Box 5816, Washington 14, D. C.	642
Internation Boiler Works Co., The, E. Stroudsburg, Pa.	158
International Nickel Company, Inc., 67 Wall St., New York 5, N. Y.	509

J

Janney Cylinder Company, Holmesburg, Philadelphia 36, Pa.	459 & 461
Jarco Services, Inc., 725 South Erie, Tulsa, Okla.	361
JENKINS BROS., 100 Park Ave., New York 17, N. Y.	133
Jerguson Gage & Valve Co., 87 Fellsway, Somerville 45, Mass.	677
JOHNS-MANVILLE SALES CORPORATION, 22 East 40th St., New York 16, N. Y.	581
Johnson Corporation, The, 805 Wood St., Three Rivers, Michigan	374, 376
Johnson March Corporation, The, 1725 Chestnut St., Philadelphia 3, Pa.	568

K

Kaiser Co., E. B., 2114 West Lake Ave., P. O. Box 276, Glenview, Ill.	564, 566
Keasbey & Mattison Company, Ambler, Pa.	161
Keeney Publishing Company, 6 N. Michigan Ave., Chicago 2, Ill.	570
Kewanee Pump Co., 236 Huntington Ave., Boston 15, Mass.	642
Keystone Valve Corporation, 5325 Kirby Drive, Houston 5, Texas	492
Kidde Nuclear Laboratories, Inc., 975 Stewart Ave., Garden City, N. Y.	720
Knapp Mills Incorporated, 23-15 Borden Ave., Long Island City 1, N. Y.	716

L

LADISH CO., Cudahy, Wisconsin	465-469
Lapp Insulator Co., Inc., Process Equipment Division, LeRoy, N. Y.	365-369
Layne & Bowler Pump Company, 2943 Vail Ave., Los Angeles 22, Calif.	437
LESLIE CO., Lyndhurst, N. J.	81
Lewellen Mfg. Co., Columbus, Indiana	542
Lewin-Mathes Company, 1111 Chouteau Ave., St. Louis 2, Mo.	398
LOVEJOY FLEXIBLE COUPLING CO., 4949 West Lake St., Chicago 44, Ill.	631
LUBRIPLATE DIVISION, FISKE BROTHERS REFINING CO. Lockwood St., Newark 5, N. J.	610
Lukens Steel Company, Coatesville, Pa.	61

Mc

McGraw-Hill Publishing Company, 330 West 42nd St., New York 36, N. Y.	91-481
McIntosh Equipment Corp., 15 Park Row, New York 38, N. Y.	361-363

M

M-H Standard Corporation, 513-521 Communipaw Ave., Jersey City 4, N. J.	56
Magnatran Incorporated, 248 Schuyler Ave., Kearny, N. J.	637

How Steam Trap Standardization *reduces* *Installation and Maintenance Work and Cost*

No Bypasses Needed. Traps can be replaced in a couple of minutes by uncoupling the unions and installing a "spare" trap complete with proper length pipe connections and half unions.

ORIFICE SIZES	
PRESSURE	SIZE
0-40	7/16
40-60	3/32
60-150	1/16

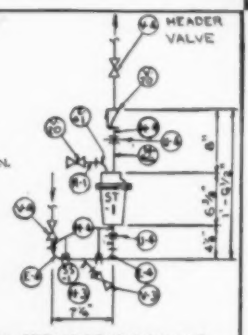
CAPACITY-0-300#/HR

NOTES:

DIMENSIONS SHOWN ARE FOR MINIMUM SPACE INSTALLATION.

IN LONG RUNS - PIPE TO BE PITCHED TOWARD TRAP.

TRAP TO BE INSTALLED BELOW DRAIN POINT IF POSSIBLE. IF NOT POSSIBLE, A CHECK VALVE MUST BE INSTALLED ON INLET SIDE OF TRAP.



BILL OF MATERIAL FOR TYPICAL STEAM TRAP HOOK-UP

MARK	QTY	MAT'L	DESCRIPTION
ST-1	1	CAST IRON	½" STEAM TRAP - ARMSTRONG #211
SS-1	1	CAST IRON	½" STRAINER - 250# W.S.P. - [redacted]
V-4	2	BRZ	½ GATE VALVE - SCRD - 200# W.S.P. - [redacted]
V-20	1	BRZ	½ GLOBE VALVE - SCRD - 200# W.S.P.
V-3	1	BRZ	½ GATE VALVE - SCRD - 200# W.S.P. - [redacted]
V-70	1	BRZ	½" CHECK VALVE - SCRD - 200# W.S.P. - [redacted]
E-4	2	FORGED STEEL	½" - 90° SCRD ELL - 2000#
E-41	1	CAST IRON	½" - 90° STREET ELL - 300# - [redacted]
U-4	2	FORGED STEEL	½" UNION - 2000# - [redacted]
N-1	1	STL	½ SHORT NIPPLE - SCH 80 - SEAMLESS ASTM A-53
N-3	1	STL	¾ SHORT NIPPLE - SCH 80 - SEAMLESS ASTM A-53
N-4	6	STL	¾ SHORT NIPPLE - SCH 80 - SEAMLESS ASTM A-53
N-4/4	1	STL	¾" - 4" LG. NIPPLE - SCH 80 - SEAMLESS ASTM A-53

Trap Maintenance Costs Reduced $25,000 per Year with Armstrongs

Major reductions in steam trap installation and maintenance work and cost can be achieved by standardization on one make of trap which, in turn, permits standardized hookups. A major chemical company reports an annual maintenance saving of $25,000 since installing 4000 Armstrong traps according to the drawing and photograph shown here. Additionally, trap parts inventory is reduced and purchasing is simplified.

Traps of a Size Interchangeable. Note that exact dimensions are given for the pipe fittings, including nipples connected to each size of trap. When a trap needs repair, the unions can be uncoupled, the trap lifted from the line, and a "spare" carrying identical pipe connections slipped in place. In as little as one or two minutes, a faulty trap is replaced. It is then repaired and takes its place as a "spare".

$25,000 Trap Maintenance Saving. Records on the Armstrong trap installation described here show that the cost of repair parts was approximately $10,000 less annually than with the traps previously used. Reduction in maintenance labor brings the total saving to $25,000, per year. *And, fuel savings attributable to the traps are at least equal to the maintenance saving.*

Standardized hookup includes test valve for trap testing, strainer, blowdown valve for cleaning trap, shut-off valves and unions for quick replacement.

FOR COMPLETE INFORMATION on the traps that slash maintenance costs ask for the Armstrong Steam Trap Book containing complete data plus selection, installation and maintenance recommendations. Call your local Armstrong Representative or write.

ARMSTRONG MACHINE WORKS, 606 Maple Street • Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

Exhibitor	Booth No.
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Malan Construction Corp., 2 Park Ave., New York 16, N. Y.	674
Mallinckrodt Chemical Works, Second and Mallinckrodt Sts., St. Louis 7, Mo.	722
MANNING, MAXWELL & MOORE, INC., 250 E. Main St., Stratford, Conn.	569-573
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.	41
Mechanical Engineering, 29 West 39th St., New York 18, N. Y.	586
Mercoid Corporation, The, 4201 Belmont Ave., Chicago 41, Ill.	176
METALLIZING COMPANY OF AMERICA, 431 East 75th St., New York 21, N. Y.	614
Metalock Repair Service, Inc., 26-15 48th Ave., Long Island City 1, N. Y.	126
Monroe Tube Company, Inc., P. O. Box 227, Monroe, N. Y.	223
Motor Generator Corporation, Troy, Ohio	546
MUNDET CORK CORPORATION, 7101 Tonnelle Ave., North Bergen, N. J.	560

N

National Tube Div., U. S. Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.	495
New Departure Div., General Motors Corp., 269 North Main St., Bristol, Conn.	372
NIAGARA BLOWER COMPANY, 405 Lexington Ave., New York 17, N. Y.	655
Nicholson File Company, Providence 1, R. I.	222
Nicholson & Company, W. H., 12 Oregon St., Wilkes-Barre, Pa.	410, 412
North American Aviation, Inc., International Airport, Los Angeles 5, Calif. Atomics International Division Rocketdyne Division	710, 714 685
Nuclear Development Corporation of America, 5 New St., White Plains, N. Y.	735
Nugent & Co., Inc., Wm. W., 3440 Cleveland St., Skokie, Ill.	442, 444
New York Belting and Packing Co., 191 Hudson St., New York 13, N. Y.	542
New York University, Department of Physics, University Heights, New York 53, N. Y.	706
Nuclear Pump Inc., 20 East Herman St., Philadelphia, Pa.	717
Nu-Type Valve Servicing Corporation, 38-54 Review Ave., Long Island City 1, N. Y.	640

O

O'Neil-Irwin Manufacturing Company, Lake City, Minnesota	215
Ohio Gear Corporation, 1333 East 179th St., Cleveland, Ohio	542
O. P. W. — Jordan Corp., 6013 Wiehe Road, Cincinnati, Ohio	364

P

P-K Industries Inc., 27 Porete Ave., North Arlington, N. J.	670-672
Pacific Valves, Inc., 3231 Walnut Ave., Long Beach 7, Calif.	438, 440
Packard New England Distributors Inc., 403 Asylum St., Bridgeport 8, Conn.	413
PANELLIT INC., 7401 N. Hamlin Ave., Skokie, Ill.	670-672
Pantex Manufacturing Corp., 521 Roosevelt Ave., Box 663, Pawtucket, R. I.	446
Patron Transmission Co., Inc., 129-131 Grand St., New York 13, N. Y.	541 & 542
Peabody Engineering Corporation, 232 Madison Ave., New York 16, N. Y.	69 & 71
Penberthy Mfg. Co., Div. of Buffalo-Eclipse Corp., 1242 Holden Ave., Detroit 2, Mich.	445
Permutit Company, The, 330 West 42nd St., New York 36, N. Y.	76
Phelps Company, Inc., Charles C., 700 New York Ave., Union City, N. J.	362-364
PHILADELPHIA GEAR WORKS, INC., G St. below Erie Ave., Philadelphia 34, Pa.	80
Philadelphia Pump & Machinery Co., 1350 Race St., Philadelphia, Pa.	150
Pick Manufacturing Company, P. O. Box 63, West Bend, Wisconsin	359
Pittsburgh Corning Corporation, 1 Gateway Center, Pittsburgh 22, Pa.	464
Plant Engineering, 110 S. Dearborn St., Chicago 3, Ill.	578, 582
Potter Aeronautical Corp., Box 532, Union, N. J.	695
Power, 330 West 42nd St., New York 36, N. Y.	481
Power Chemical Co., 132nd St. & Hudson River, New York 27, N. Y.	666
Power Engineering 110 S. Dearborn St., Chicago 3, Ill.	578, 582
Preferred Utilities Manufacturing Corporation, 1865 Broadway, New York 23, N. Y.	98
Putman Publishing Company, 111 E. Delaware Place, Chicago 11, Ill.	423, 425

R

Ramo-Wooldridge Corporation, The, 5730 Arbor Vitae St., Los Angeles 45, Calif.	687
Ramsey Chain Co., Albany, N. Y.	541
Rapid Electric Co., 2881 Middletown Road, Bronx 61, N. Y.	621
RAYBESTOS-MANHATTAN, INC., Passaic, N. J.	163
Raymond Corporation, The, Greene, N. Y.	668
Reaction Motors, Inc., Denville, N. J.	685E
Reeves Pulley Co., Div. of Reliance Electric & Engineering Co., Columbus, Indiana	73-75
Reliance Electric and Engineering Co., 1088 Ivanhoe Road, Cleveland 10, Ohio	73-75
Republic Steel Corp., Steel and Tubes Division, 224 East 131st St., Cleveland 8, Ohio	436
Research-Cottrell, Inc., P. O. Box 750, Bound Brook, N. J.	85
Ribble Co., C. H., 31 Di Carolis Court, Hackensack, N. J.	192-194-196
Richmond Engineering Co., Inc., 7th and Hospital Streets, Richmond, Va.	156
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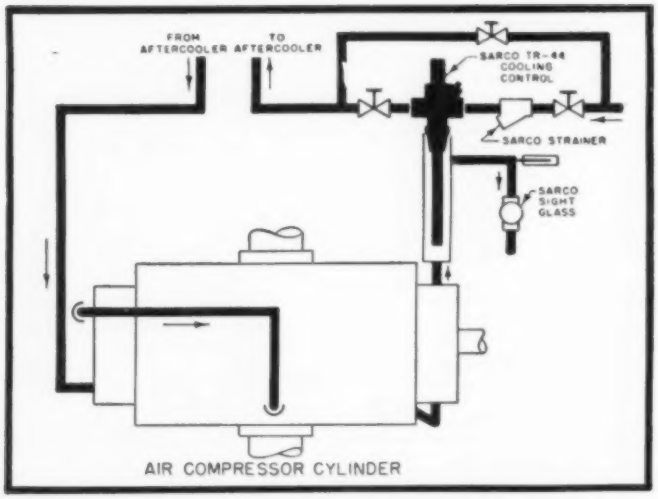
Rockwood Pulley Manufacturing Co., Inc., 20 Crosby St., New York 13, N. Y.	541
Rockwood Sprinkler Company, 38 Harlow St., Worcester 5, Mass.	676-678
Roth Company, Roy E., 2420 4th Ave., Rock Island, Ill.	128
Rotherm Engineering Company, Inc., 7280 West Devon Ave., Chicago 31, Ill.	625

S

SARCO COMPANY, INC., Empire State Bldg., New York 1, N. Y.	234
Scam Instrument Corp. The, 1811 West Irving Park Rd., Chicago, Ill.	395
Schaub Engineering Co., Fred H., 2110 S. Marshall Blvd., Chicago 23, Ill.	67
Scherr Co., Inc., George, 200 Lafayette St., New York 12, N. Y.	183 & 185
Schrader's Son, A., Div. of Scovill Mfg. Co., Inc., 470 Vanderbilt Ave., Brooklyn 38, N. Y.	213
Sealol Corporation, Warwick Industrial Park, Providence, R. I.	364



Sarco Cooling Control guards against dangerous over and under cooling.

Compressors

work better, last longer, cost less to run

with SARCO

COOLING CONTROLS

YOU have to keep your eye on a lot of things to get top efficiency from compressed air systems – and one of the most important is *cooling*.

For example, overcooling – usually a result of manual control – causes condensation on cylinder walls which destroys lubricant and increases wear. In addition, it wastes water.

If you're undercooling, you're cutting down on compressor capacity – and you're taking chances of damaging cylinders, pistons, valves and seats.

It's a lot easier – and also safer and more economical – to let dependable Sarco self-operated temperature controls take over. They insure optimum cooling effect with minimum water consumption regardless of load variation, changes in pressure and temperature of water supply. *You get protection for compressors with maximum efficiency at minimum cost.*

Send for Bulletin No. 520-A "Is Your Air Compressor Capacity Effective?" Sarco Company, Inc., Empire State Building, New York 1, N. Y. Representatives in principal cities.

Simple, self-operated Sarco TR-44 cooling control requires no auxiliary power. Liquid expansion system provides perfect throttling throughout temperature range.

SARCO

COOLING CONTROLS • DRAIN TRAPS • STRAINERS
THERMOSTATS • PRESSURE SWITCHES

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Sheldon Machine Company, Inc., 4250 North Knox Ave., Chicago 41, Ill.	215
SHELL OIL COMPANY, 50 West 50th St., New York 20, N. Y.	596
Sier-Bath Gear & Pump Co., Inc., 9252 Hudson Blvd., North Bergen, N. J.	165
Sims Pump Valve Company, Inc., 1314 Park Ave., Hoboken, N. J.	639
SOUTHERN POWER AND INDUSTRY, 806 Peachtree St., N. E., Atlanta 8, Ga.	493
Sparling Meter Company, 650 First Ave., West, Roselle, N. J.	70
Spence Engineering Company, Inc., 29-41 Grant St., Walden, N. Y.	206
Spencer Turbine Company, The, 486 New Park Ave., Hartford 6, Conn.	682
Spittler, Inc., Henry A., Route 208, Monroe, N. Y.	223
Square D Company, 6060 Rivard St., Detroit 11, Michigan	635
Squires Company, The C. E., 18502 Syracuse Ave., Cleveland 10, Ohio	120
Steel and Tubes Div., Republic Steel Corp., 224 East 131st St., Cleveland 8, Ohio	436
Stephens-Adamson Mfg. Co., Aurora, Ill.	164
Sticht Co. Inc., Herman H., 27 Park Place, New York 7, N. Y.	627
Stickle Steam Specialties Co., Indianapolis 18, Indiana	632
Stillwater Clay Products Company, The, 3334 Prospect Ave., Cleveland 15, Ohio	665
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Sumco Engineering Company, P. O. Box 193, Caldwell, N. J.	681
SUPERIOR COMBUSTION INDUSTRIES, INC., 1475 Broadway, New York 36, N. Y.	238
Sylvania Electric Products Inc., Atomic Energy Division, Bayside, L. I., N. Y.	709

T

Talcott, Inc., 91 Sabin St., Providence, R. I.	673
Technical Publishing Company, 110 S. Dearborn St., Chicago 3, Ill.	578, 582
TEXAS COMPANY, THE, 135 East 42nd St., New York 17, N. Y.	360
Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J.	742
Thomas Conveyor Co., Inc., P. O. Box 578, Burleson, Texas	542
Thomas' Register of American Manufacturers, 461 Eighth Ave., New York 1, N. Y.	46
Titeflex, Inc., Industrial Division, Springfield, Mass.	171
Toledo Pipe Threading Machine Co., The, Toledo 4, Ohio	193, 195
Toledo Timer Co., 2224 Albion St., Toledo, Ohio	542
Trerice Company, H. O., 1420 W. Lafayette Blvd., Detroit 16, Mich.	675
Troy Engine & Machine Company, 1492 Railroad Ave., Troy, Pa.	594

Exhibitor	Booth No.

U

United States Atomic Energy Comm., Washington 25, D. C.	356
United States Steel Corporation, National Tube Division, 525 William Penn Place, Pittsburgh 30, Pa.	495

V

Vapor Heating Corporation, 80 E. Jackson Blvd., Chicago 4, Ill.	38
Velan Steam Specialties, Inc., 37 South River St., Plattsburgh, N. Y.	49
VOGT MACHINE CO., HENRY, 19th & Ormsby Streets, Louisville 10, Ky.	164
VOSS CO. INC., J. H. H., 785 East 144th St., New York 54, N. Y.	613

W

W-K-M Manufacturing Co., Inc., Subsidiary of ACF Industries Inc., Houston, Tex.	670-672
Waldron Corporation, John, P. O. Box 791, New Brunswick, N. J.	201
Walker, Crosweller and Co., Ltd., Whaddon Works, Cheltenham, England	361
Wallace & Tiernan Incorporated, 25 Main St., Belleville 9, N. J.	565
Warrick Co., Charles F., 1964 West Eleven Mile Road, Berkley, Mich.	361
Watlow Electric Manufacturing Co., 1376 Ferguson Ave., St. Louis 14, Mo.	192
Wayne Pump Company, Fort Wayne, Indiana	363
Wells Manufacturing Corporation, Three Rivers, Mich.	191
Wells & Sons, W. F., Three Rivers, Mich.	216E
WESTINGHOUSE ELECTRIC CORPORATION, Gateway Center, 401 Liberty Avenue, P. O. Box 868, Pittsburgh 30, Pa.	732
Wetzler Clamp Co., 43-15 11th St., Long Island City 1, N. Y.	225
WHEELER MANUFACTURING COMPANY, C. H., 19th & Lehigh Avenue, Philadelphia 32, Pa.	44
Wiedeke Company, The Gustav, 1833 Richard St., Dayton 1, Ohio	574
Wilson, Inc., Thomas C., Wilson Bldg. 21-11, 44th Ave., Long Island City 1, N. Y.	575
WING MFG. CO., L. J., 50 Vreeland Mills Road, Linden, N. J.	79
Wright Austin Company, 3245 Wight St., Detroit 7, Mich.	615

Y

YARNALL-WARING COMPANY, Chestnut Hill, Philadelphia 18, Pa.	532
York-Shipley, Inc. (Ind. Div.), York, Pa.	52

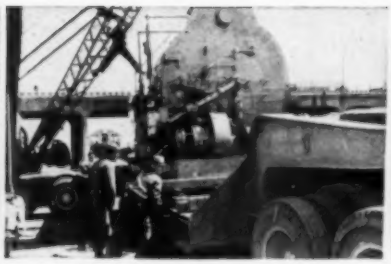
Z

Zonolite Company, 135 S. LaSalle St., Chicago, Ill.	642
Zurn Manufacturing Division, J. A., Zurn Industries, Inc., Erie, Pa.	42

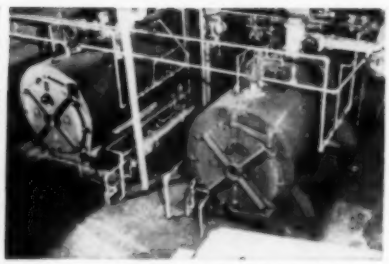
ADDITIONAL sections of displays have widened the scope of the 22nd National Exposition of Power and Mechanical Engineering, which will make its first appearance in the New York Coliseum after a four-year absence from the city where it was first held, 34 years ago.

The exposition continues under the auspices of The American Society of Mechanical Engineers, and will be simultaneous with the Society's 76th Annual Meeting, November 26-30.

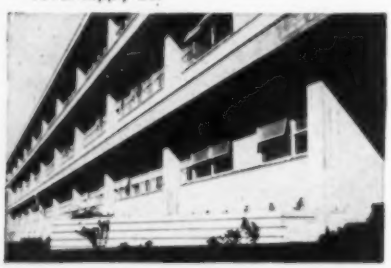
300 hp Cyclotherm with 1 to 6 modulation operates with no loss of efficiency at *Lorain Towel Supply Co.*



New, 750 hp Cyclotherm is most powerful package boiler ever developed. Delivers 26,000 pounds of steam per hour to a Denver linen supply company.

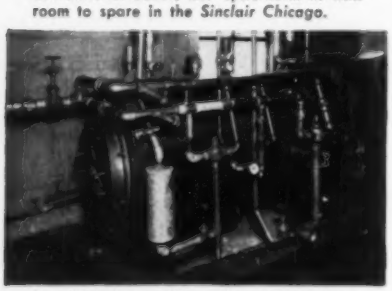


Annual savings of over $18,000 in labor, fuel and insurance costs, by installing two 125 hp Cyclotherms at *Howard Arthur Manufacturing Co.*



Reverse Boiler Water Flow on two, 60 hp Cyclotherm step up heating efficiency at *San Diego Education Center.*

Shipboard boiler room was too small for a conventional boiler, but Cyclotherm fit with room to spare in the *Sinclair Chicago.*



One Cyclotherm delivers three temperatures of water — 90°, 125° and 185° — simultaneously with no storage tank. No attendant needed.

Six different problems with one answer...

CYCLOTHERM

When you have a problem in steam or hot water generating, chances are Cyclotherm will be *your* answer, too. These are but a few of the hundreds of applications where Cyclotherm has outshown other boilers in economy, space and performance. Operating on the patented Cyclonic Combustion principle, Cyclotherm gives intense, but controlled heat through the length of the furnace. Hot spots and heat-retarding scale are eliminated by distributing the flame evenly, without impingement. In up to ⅔ the space required by an ordinary boiler, you can install a Cyclotherm. Its simple, streamlined construction saves up to 50% of maintenance costs, and delivers a guaranteed minimum of 80% efficiency in only 2 passes.

The Cyclotherm Steam or Hot Water Generator is delivered complete, ready to go with five simple connections. No additional insulation or instrumentation is needed, and you supply only a simple flue—not a costly stack. Cyclotherm models range from 18 to 750 hp, from 15 to 200 psi. Larger units regulate firing ratio from 30% to 100% of rating without losing efficiency. All models are factory tested, and are warranted free of all defects in workmanship or materials for one year. *For an 8-page booklet describing over 30 different Cyclotherm installations, write today to Dept. 2229*

CYCLOTHERM DIVISION National-U.S. Radiator Corp., Oswego, N. Y.

See the Cyclotherm Exhibit—22nd Annual National Power Show ASME, Nov. 26 to 30. Booth 506, N. Y. Coliseum

The Booming South and Southwest . . .

New Plants — Expansions

√ **Manufacturing Plants**
√ **Utility Plants**
√ **Large Service Plants**

Highlights for December, 1956

South Atlantic

Kaiser Aluminum & Chemical Co. is erecting a $400,000 pilot chemical plant on a 40 acre site in **Nichols, Fla.** with completion anticipated early in 1957 . . . **Orlando, Fla.'s Utilities Commission** is awaiting delivery of two gas turbine-generator sets, having a combined capacity of 33,000 kw, from General Electric Co.'s Gas Turbine Dept. for its **Municipal Power Station**—delivery to be in July and October, 1957.

Southeastern Construction Co. will construct the 48,000 sq ft, multi-million dollar nuclear support laboratory building at **Dawsonville, Ga.** for the Air Force's **Georgia Nuclear Laboratory.**

$1,000,000, 200,000 ft building underway for **Allison-Irwin Co.** at **Charlotte, N. C.** which, upon its completion in Sept., 1957, will be used for general offices and warehouses . . . **Fontana Mills, Inc.** planning a 100,000 sq ft plant for the manufacture of wilton and velvet carpeting in **Robbinsville, N. C.**

Multi-million dollar **Owens-Corning** fiberglas plant addition underway in **Anderson, S. C.** with completion anticipated in mid-1957 . . . **Kingan Plant** of Hygrade Food Products, Inc. planning to triple its present multi-million dollar business at **Orangeburg, S. C.**

These highlights briefed from SPI's SOUTHERN INDUSTRIAL NEWS SERVICE, a monthly publication issued exclusively to SPI advertisers and their representatives through the South and Southwest.

Nylon plant producing 40,000,000 lb of fiber annually planned at **Amphill, Va.** for Du Pont Corp.'s **Sprague Rayon Plant** — to be completed in 1957 . . . $2,000,000 plant in **Charlottesville, Va.** nearing completion for **Sperry Piedmont Corp. . . . Lester Brothers, Inc.** of **Martinsville, Va.** will double its output of prefab homes at a cost of $1,000,000 . . . $10,000,000 center for development and testing fuel systems and auxiliary power plants for rockets and guided missiles planned by **Thompson Products, Inc.** on a 1,100 acre site in **Roanoke, Va. . . .** January 1 will see the beginning of a new plant for **Basic-Witz Furniture Industries, Inc.** in **Staunton, Va.** . . . Upon its completion late in 1957, the multi-million dollar **Du Pont Corp.** plant in **Waynesboro, Va.** will produce 40,000,000 lb of Orlon Staple and Tow annually . . . **American Oil Co.** effecting plans for a plant to process oil for production of asphalt in **Yorktown, Va.**

Spencer Mfg. Co. erecting a $100,000, 22,000 sq ft building in **Spencer, W. Va.** for manufacturing knitgoods.

East South Central

$440,000 expansion program underway for **M & H Valve & Fittings Co.** in **Anniston, Ala. . . .** Nearing completion for **Hedstrom Union** is the $155,000 plant expansion in **Dothan, Ala. . . .** 25,000 sq ft lingerie plant for **Marion Lingerie, Inc.** underway in **Marion, Ala.** — to cost $150,000 . . . **Anderson Electric Corp.** is again expanding its aluminum products facilities in **Leeds, Ala.,** bringing the total expansion since the first of the year to 32,000 sq ft.

$3,000,000 addition underway for **American Synthetic Rubber Co.** in **Louisville, Ky.** which will increase facilities 50%.

Dixie Aluminum Corp. effecting plans for construction of $400,000 aluminum extrusion plant for the manufacture of tubing in **Hattiesburg, Miss. . . .** Multi-million dollar high analysis mixed fertilizer plant planned for **Coastal Chemical Corp.** in **Pascagoula, Miss. . . .** 50,000 sq ft plant, costing $450,000, planned for **Fulton, Miss.** by **General Shoe Corp.**

$1,000,000 fruit processing plant under construction at

(*Continued on page 70*)

New Plants —*Continued from Page 69*

Humboldt, Tenn. by **J. Hungerford Construction Co.** . . . Underway is the new plant and warehouse for **Tucker Steel Corp.** on a 12½ acre site in **Knoxville, Tenn.** — to cost $500,000 . . . **Mid-South Metal Products Co.** to erect $100,000 illuminating shell plant in **Memphis, Tenn.** . . . $3,000,000 training center occupying a 20 acre tract in **Memphis, Tenn.** is planned for **Chrysler Corp.**

West South Central

Jones Furniture Mfg. Co. erecting a new plant for the production of upholstered furniture in **Benton, Ark.** . . . 120,000 sq ft equipment and hardware factory planned in **Forrest City, Ark.** for **Yale & Towne Mfg. Co.**

$20,000,000 plant to be constructed by **Wyandotte Chemicals Corp.** in **Geismar, La.** with completion scheduled for the latter part of 1958 . . . **Dow Chemical Co.** planning a $30,000,000 expansion on a 1,700 acre tract in **Plaquemine, La.** . . . Consideration being given to a $2,000,000 sewerage project in **Westwego, La.** . . . Construction getting underway on **Gaylord Container Corp.'s** $4,000,000 facility for producing multi-wall paper bags in **Bogalusa, La.**

$6,500,000 metals plant underway in **Muskogee, Okla.** for **Tantalum Defense Corp.** . . . **The Naturizer Co.** constructing $180,000 compost plant on a 24 acre tract in **Norman, Okla.** . . . March, 1957 is the scheduled date for completion of the $500,000 atomic radiation laboratory for **Continental Oil Co.** in **Ponca City, Okla.** . . . 16,000 sq ft building planned for a 7½ acre site in **Tulsa, Okla.** for **Air-O-Blind Co.** with completion anticipated by summer of '57.

$1,006,600 addition underway in **Dumas, Tex.** for the Federal Government's **Exell Helium Plant** — $4,000,000 of equipment has been purchased by the Bureau of Mines for installation . . . Multi-million dollar expansion program planned for **Diamond Alkali Co.'s** Ship Channel Plant at **Houston, Tex.** . . . $10,000,000 expansion proposed for **Westinghouse Electric Supply Co.** in **Houston, Tex.** . . . **Gulf States Utilities Co.** has purchased 1,295 acres of land in **Lake Charles, Tex.** for construction of a multi-million dollar power plant . . . $100,000 **Dowell Oil Field Servicing Plant** underway in **Perryton, Tex.**— $750,000 of equipment will be installed . . . **Bassons Industries Corp.** effecting plans for construction of a multi-million dollar branch plant in **Nacogdoches, Tex.** to produce plastic and Teflon insulated wire and cable products and reinforced plastic air craft parts and subassemblies.

Kansas and Missouri

40,000 sq ft plant, costing $200,000 being planned for **Annshire Garment Co.** in **Pittsburg, Kans.** . . . **Magnolia Petroleum Co.** constructing a new gasoline plant in **Attica, Kans.** which will process gas from both gas and oil wells.

Communications Accessories Corp. is consolidating its scattered manufacturing facilities into a $50,000 sq ft structure which will be erected on a 30 acre tract in **Lee's Summit, Mo.**

Call System Pays

WHILE WORKING over a steam power station in the Southwest I had occasion to purchase from the dismantled Edgar Zinc Smelter some second hand material, including an automatic telephone system, dial instruments, etc.

The steam plant we were reconditioning was scattered over several acres on both sides of a railroad, and we had our own switch and coal storage tracks.

When I went out into the plant in an effort to contact a supervisor, I usually, after some delay, found him "looking for someone or contacting the stores department"—a good alibi.

The original cost of this telephone set and code call was returned each month in time saved, greater efficiency and safer operations.

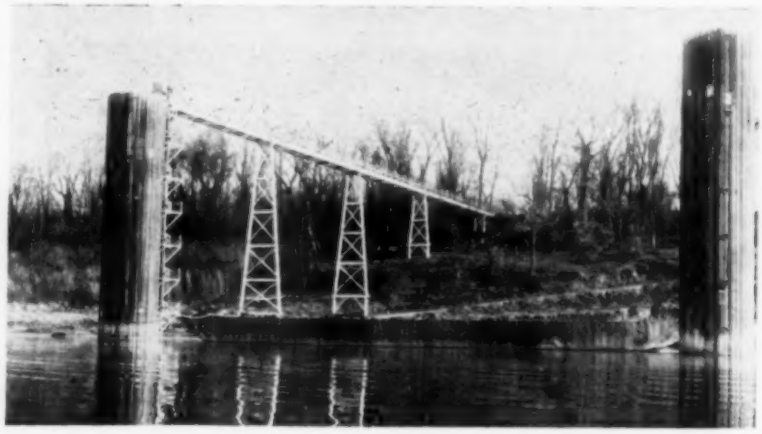
This later led to purchasing a new set for the central office in an adjoining state.

By GEORGE W. IREY, Jackson, Mo.

Floating Barge Dock

A BARGE dock was constructed on the Ohio River near Louisville, Ky., at a point where the river level fluctuates substantially. The dock serves a new petroleum products distribution terminal of the Triangle Refineries, Inc., of Houston, Texas.

Dravo Corporation, Pittsburgh, solved the problem of varying water level by constructing an efficient, but relatively-inexpensive "floating dock." The dock consists of a captive barge moored between two cells of steel sheet piling. The barge, fastened to the cells by a guide arrangement, floats up and down with the river level. A 280 ft steel walkway connects the dock to the shore and supports pipe lines through which barges are loaded and unloaded.



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POWER COMPANIES SELECT INGALLS

Alabama Power Company
Arkansas-Missouri Power Company
Arkansas Power & Light Company
Boston Edison Company
Carolina Power & Light Company
Central Hudson Gas & Electric Corporation
Central Illinois Public Service Company
Central Louisiana Electric Company, Int.
Cia Cubana Electricidad
The Cincinnati Gas & Electric Company
City of Jacksonville, Florida
City Public Service Board — San Antonio
The Cleveland Electric Illuminating Co.
Columbus & Southern Ohio Electric Co.
Consolidated Edison Company
Consumers Power Company
Duke Power Company
Electric Energy, Inc.
Florida Power Corporation
Florida Power & Light Company
Georgia Power Company
Gulf Power Company
Hartford Electric Light Company
Indiana & Michigan Electric Company
Indiana-Kentucky Electric Corporation
Jersey Central Power & Light Company
Kentucky Utilities Company
Long Island Lighting Company
Louisiana Power & Light Company
Mississippi Power Company
Mississippi Power & Light Company
Monongahela Power Company
Montaup Electric Company
Ohio Edison Company
Ohio Power Company
Pacific Gas & Electric Company
Pennsylvania Power Company
Philadelphia Electric Company
Public Service Company of Indiana
Rockland Light & Power Company
South Carolina Electric & Gas Company
South Carolina Public Service Authority
Southwestern Gas & Electric Company
Tennessee Valley Authority
The Tucson Gas, Electric Light & Power Co.
Western Massachusetts Electric Company

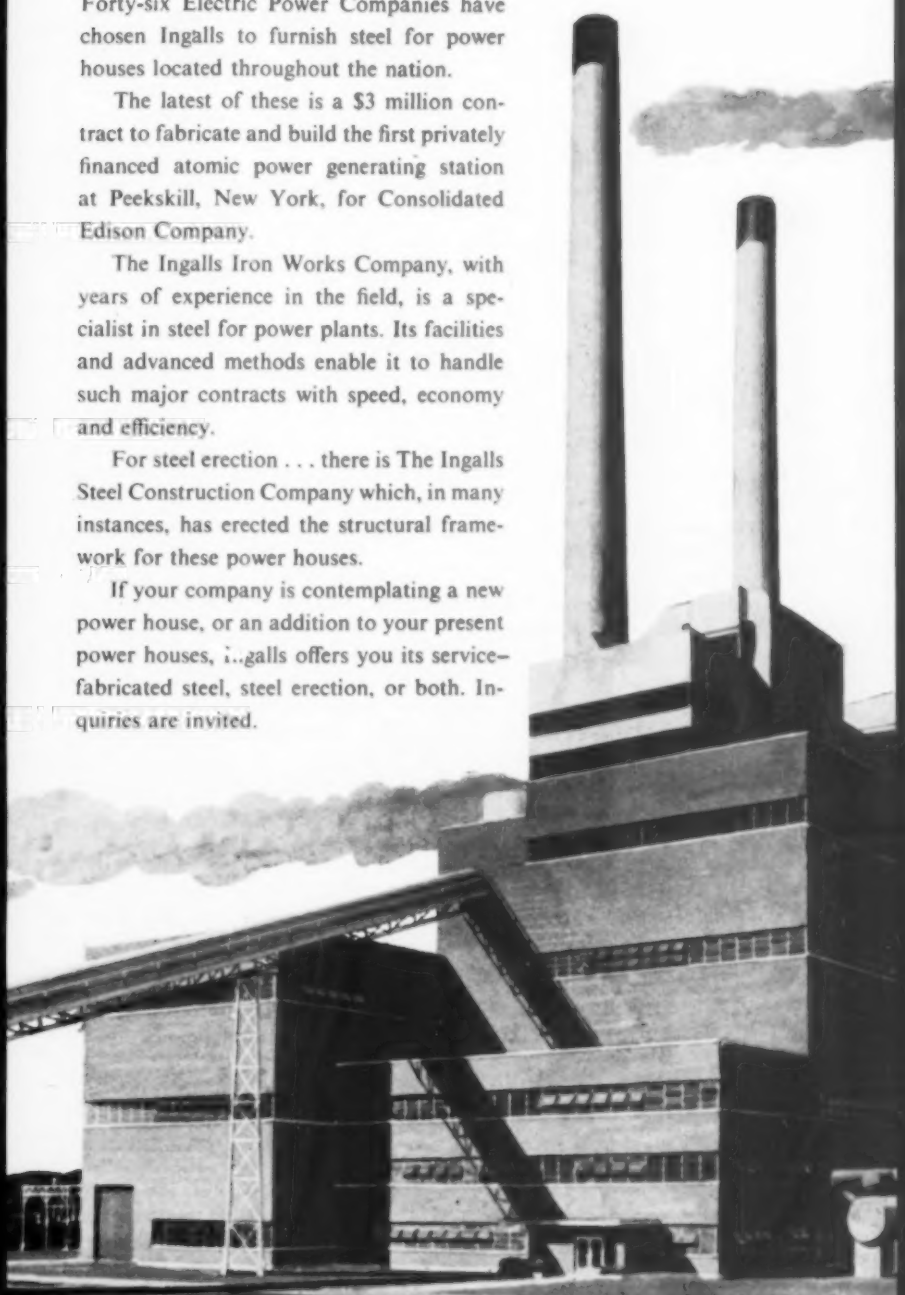
Forty-six Electric Power Companies have chosen Ingalls to furnish steel for power houses located throughout the nation.

The latest of these is a $3 million contract to fabricate and build the first privately financed atomic power generating station at Peekskill, New York, for Consolidated Edison Company.

The Ingalls Iron Works Company, with years of experience in the field, is a specialist in steel for power plants. Its facilities and advanced methods enable it to handle such major contracts with speed, economy and efficiency.

For steel erection . . . there is The Ingalls Steel Construction Company which, in many instances, has erected the structural framework for these power houses.

If your company is contemplating a new power house, or an addition to your present power houses, Ingalls offers you its service–fabricated steel, steel erection, or both. Inquiries are invited.



FABRICATING STEEL IS OUR BUSINESS

THE INGALLS

IRON WORKS COMPANY

BIRMINGHAM, ALABAMA

SALES OFFICES: New York, Chicago, Pittsburgh, Houston, Atlanta, New Orleans
PLANTS: Birmingham, Ala., Verona, Pa., North Birmingham, Ala., Decatur, Ala., Pascagoula, Miss.

Three Basic Lessons on Plant Application of Pumps
Net Positive Suction Head

N P S H

By WILLIS BABCOCK

Chief Development Engineer
Aurora Pump Division
The New York Air Brake Company

PART 1—Defines absolute pressure and vapor pressure, and gives constants and explanations necessary to understand NPSH and recognize its importance.

MODERN day pump application, particularly in the industrial and power plant fields, is more and more demanding upon pump suction conditions. Operating temperatures are constantly increasing. Process systems require the operation of pumping equipment under very high vacuums so that the fluid being pumped is very near the vapor point. Chemical fluids with viscous, volatile, and unstable properties make pump selection problems ever more difficult.

Progress in the application of pumping equipment to these various fields has been made possible only by the constant research of hydrodynamics engineers in the problems of cavitation and its effect on the performance and life of hydrodynamic equipment.

Through this research, the theories and formulae of the concept of Net Positive Suction Head (NPSH) have evolved to simplify the selection of pumping equipment for difficult applications. Much of the progress in the industrial and power plant fields would not have been possible without this research.

Because of the various controversies regarding the causes and effects of the phenomena of cavitation, the theories of NPSH have been made unnecessarily difficult for many involved in the specifying, selecting, and application of pumping equipment to understand. These three articles will clarify the basic fundamentals of NPSH. Part 1 is presented here. Part 2 will discuss cavitation, and Part 3 will present calculations of NPSH.

WATER weighs 62.4 pounds per cubic foot, and a vertical column of water 2.31 ft in height exerts a gauge pressure of 1 pound per square inch. Air, under standard conditions at sea level, weighs .075 pounds per cubic foot. The total height of the atmosphere exerts a pressure of 14.7 pounds per square inch on a surface at sea level. We do not feel the force of this pressure since it is exerted both inside and outside the body with the net result of equalization.

The evidence of this pressure is readily seen when a thin walled container collapses after the air inside has been removed. Absolute atmospheric pressure can be and is measured by absolute pressure gauges such as the common barometer.

Absolute Zero

In far space where there is no atmospheric or other matter to produce pressure, the absolute pressure is said to be 0 or near 0. This 0 point is called absolute 0. Any pressure measured from this 0 point is called absolute pressure. Atmospheric pressure is measured from this 0 point and is, therefore, *absolute*.

Ordinary pressure gauges do not measure pressure from absolute 0. The 0 point used in this type of gauge is atmospheric pressure. Readings expressed by these gauges are called gauge pressures and are given, usually, as pounds per square inch gauge or psig. Sometimes the g is dropped and the reading is given as psi. To convert to absolute pressure, one has only to add atmospheric pressure of 14.7 pounds per square inch absolute to the gauge pressure reading. This then corrects the gauge pressure back to absolute zero reference.

Gauge Readings

Vacuum gauges use atmospheric pressure as the 0 reference point. Vacuum gauge readings are negative pressure readings caused by the removal of air or other medium from a closed system. Atmospheric pressure must also be added to vacuum gauge readings to obtain absolute pressure, giving proper attention to the algebraic signs involved. Vacuum, expressed as pressure, has a minus sign. Atmospheric pressure has a positive sign.

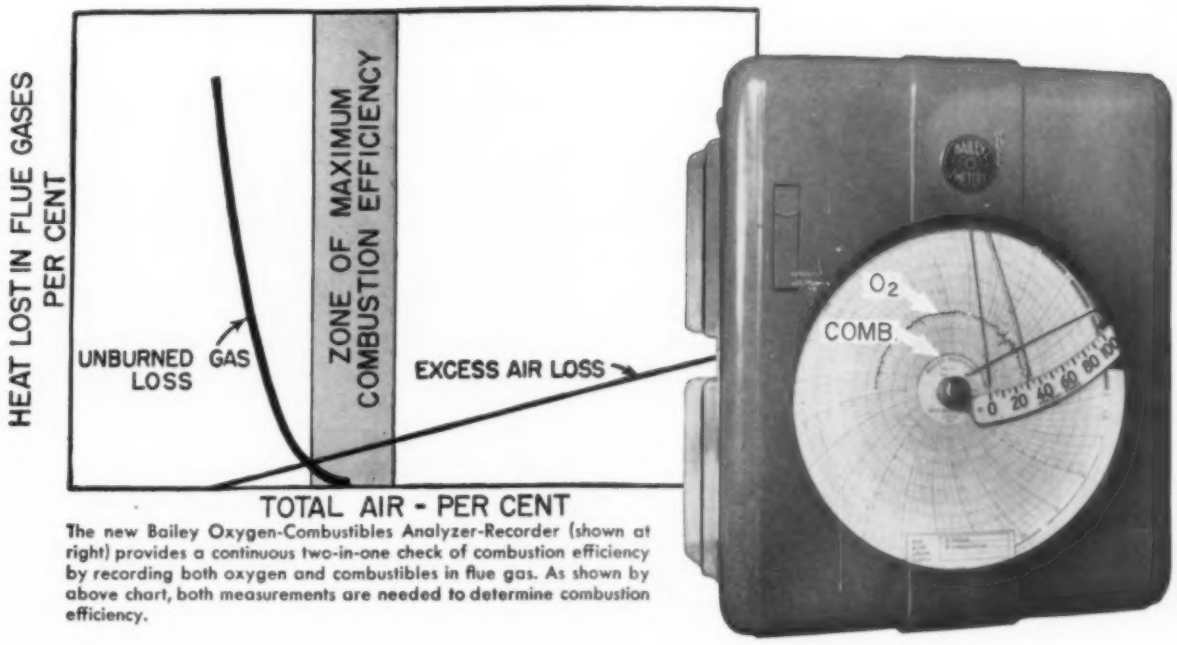
Conversion Factors

The conversion of pressure and vacuum gauge readings may be expressed by the following two formulae:

$$P_g + P_a = P_s \quad (1)$$
$$P_a - P_v = P_s \quad (2)$$

P_g = Gauge pressure
P_a = Atmospheric pressure
P_s = Absolute pressure
P_v = Equivalent pressure of the vacuum

All factors in the equations must be in the same units. These units



The new Bailey Oxygen-Combustibles Analyzer-Recorder (shown at right) provides a continuous two-in-one check of combustion efficiency by recording both oxygen and combustibles in flue gas. As shown by above chart, both measurements are needed to determine combustion efficiency.

BAILEY announces . . .
New 2 in 1 way to measure Combustion Efficiency

The new Bailey Oxygen-Combustibles Analyzer-Recorder gives you a continuing double check on combustion economy. It's fast response measures and records:

1. Excess air—regardless of the fuel or combinations of fuels being burned.

2. The mixing efficiency of your fuel-burning equipment—by indicating the amount of combustibles in your flue gas, resulting from incomplete mixing of fuel and air.

Combustion efficiency depends upon fuel-air ratio. Too much fuel can be even more costly than too much air. And because of the interdependence of these two factors, no control that measures only one of them can give you complete protection.

Now, for the first time, you can check *both* with a *single* fast acting instrument, using the new Bailey Oxygen-Combustibles Analyzer-Recorder for industrial furnaces, kilns, heaters and boilers.

Fuel economy improves as excess air is reduced —until unburned fuel begins to show up in the flue gas. When this happens, combustion efficiency drops off sharply if there are further decreases in the air-fuel ratio. That's why combustion gases must be analyzed for *both* oxygen and combustibles to get a true indication of efficiency—and that is why Bailey coordinates both measurements on the same chart, to show when excess air may be reduced safely without danger of greater losses from unburned gases.

The Bailey Oxygen-Combustibles Analyzer is an approved combustion safeguard.

Ask your local Bailey engineer for suggestions on application. Equipment details in Product Specifications E65-1 and E12-5. P31-1

BAILEY METER COMPANY

1028 IVANHOE ROAD • CLEVELAND 10, OHIO

INSTRUMENTS AND CONTROLS

For Power And Process

are usually pounds per square inch or feet head or inches of mercury. The conversion factors used to obtain like units for water are:

PSIG x 2.31 = Ft head (3)
Inches of Hg x 1.131 = Ft head (4)
Ft head x .433 = PSIG (5)
PSIG x 2.037 = Inches of Hg (6)
Inches of Hg x .491 = PSIG (7)
Ft head x .884 = Inches of Hg (8)

Graph No. 1* shows the conversion between the various units.

In addition to the above, the following conversion factors are required to obtain absolute pressure readings.

At 70 F, 60% humidity, and sea level:

1 atmosphere = 14.7 PSI absolute (9)
1 atmosphere = 29.92 inches of Hg absolute (10)
1 atmosphere = 33.9 feet head absolute (11)

As one goes higher and higher into the atmosphere above sea level the column of air above becomes lighter and lighter and hence the absolute pressure exerted by this smaller column of air becomes lower. Atmospheric pressure decreases, then, with altitude. Chart No. 1* shows the atmospheric pressure for different altitudes. Since NPSH calculations are made in terms of absolute pressure, it is very important to have a thorough working knowledge of equations 1 through 11.

Vapor Pressure

Water will boil at approx. 212 F when the atmospheric pressure (at sea level) is 14.7 pounds per square inch absolute. By "boiling" we mean that vapor bubbles are formed as the water passes from a liquid to a vapor state. At 212 F and 14.7 pounds per square inch absolute, water and water vapor can exist together in a state of equilibrium. In other words, water may exist as a liquid at this temperature and pressure or it may exist as a vapor, or both phases may exist together.

When water boils in a shallow open kettle with a submerged thermometer, the temperature of the water just before bubbles are formed is 212 F at sea level (14.7 pounds absolute). When the bubbles are formed and the water is boiling violently, the temperature remains at 212 F as long as the kettle remains open to the atmosphere. No matter how much heat is applied to the water, the temperature will not rise above 212 F.

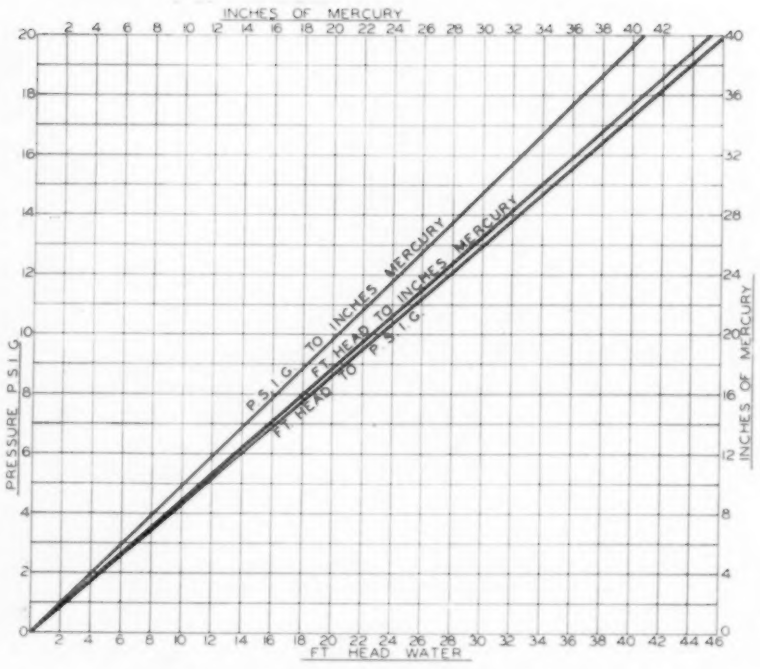
From this observation it is apparent that some heat must be added to the water at 212 F in order to produce vapor bubbles at 212 F. This amount of heat is called the "latent heat of vaporization."

At atmospheric pressure (14.7 absolute), the latent heat of vaporization of water at 212 F is 970 Btu per pound. This is merely another way of saying that it takes 970 Btu of additional heat to convert each pound of water in the liquid state at 212 F to the vapor state of 212 F.

Bubbles and Pressure

Bubbles of vapor form at the bottom of a pan and rise to the surface when water boils. A bubble cannot exist unless the pressure inside itself is equal to the pressure outside. If the bubble pressure inside were lower or higher than the outside pressure the bubble would either collapse or explode. If the pressure outside the bubble at sea level is 14.7 pounds per square inch absolute, then the pressure inside the bubble must be 14.7 pounds per square inch absolute at 212 F. Since the bubble is composed of vapor, it is this vapor alone which can exert this internal pressure.

This internal pressure exerted by a bubble of vapor in equilibrium with its liquid is called *vapor pressure*. It then follows that the vapor pressure of water at atmospheric pressure and 212 F is 14.7 pounds per square inch absolute. Note that all vapor pres-

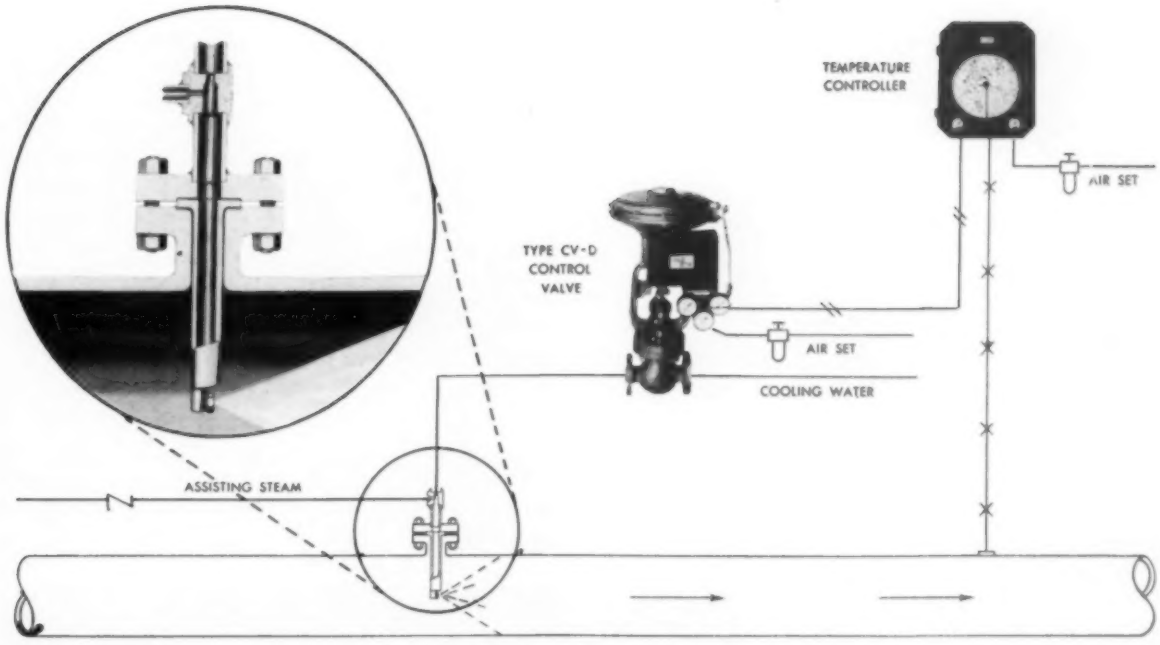


Conversion units between various units

CHART NO. 1
Altitude and Pressure

Altitude Feet	Pressure Psig	Pressure Inches Hg
0	14.690	29.920
50	14.665	29.865
100	14.640	29.810
200	14.590	29.710
300	14.530	29.600
400	14.480	29.490
500	14.430	29.380
1,000	14.170	28.860
2,000	13.660	27.820
3,000	13.160	26.810
4,000	12.690	25.840
5,000	12.220	24.890
10,000	10.110	20.580

*Graph No. 1 and Chart No. 1 are presented here merely for illustration. Working information will be presented in a later installment.



Normal installation of a Copes-Vulcan Steam-Assist Desuperheater is shown schematically

Get more accurate control with the NEW Copes-Vulcan Steam Assist Desuperheating Station!

Both carburetor and in-line types are available in the new Copes-Vulcan Steam-Assist Desuperheater

Here is a desuperheater based on a new, proven principle that delivers more accurate control of final steam temperature for process work or auxiliaries. It uses steam only on lighter loads. As load increases, the flow of assisting steam is automatically reduced—normally without an atomizing-steam valve. Assisting steam can be off completely at high loads where no more than mechanical atomization is needed. Control is close, even at 10 degrees above saturated temperature.

Cooling water and assisting steam are intimately mixed in the exclusive Swirl Chamber—upstream from the point of injection. No large steam bubbles form to cause annoying hammer or vibration.

Incorporated into the station for close modulating control of cooling water flow is the new Copes-Vulcan Type CV-D Valve. It is designed for the exact operating characteristics suited to your needs.

Enjoy the benefits of Copes-Vulcan desuperheating, custom-engineered for your individual requirements. Be sure of accurate control, minimum maintenance and long service life. Write for Bulletin 1024.

50th Anniversary
BLAW-KNOX
1906-1956

COPES-VULCAN DIVISION

BLAW-KNOX COMPANY

ERIE 4, PENNSYLVANIA

COPES VULCAN

sures are absolute pressures with reference point being absolute 0.

If the pressure on the water at the bottom of the pan is increased by increasing the total height of water so that the total absolute pressure exerted on the bottom of the pan is equal to atmospheric pressure plus the head due to the height of water, the water at the bottom of the pan would no longer boil at 212 F, but at a higher temperature.

If we were to hold the temperature at 212 F, the water would not boil at the bottom of the pan. On the other hand a shallow pan of water at a higher altitude would boil at a temperature of less than 212 F since the absolute pressure on the liquid would be less than 14.7 pounds per square inch absolute.

Therefore, the absolute pressure at which any liquid will boil or at which the liquid and vapor phases can exist in equilibrium is called that liquid's vapor pressure. There is a definite vapor pressure for every temperature which will result in vaporization. Therefore, every fluid has an infinite number of vapor pressures which change as the pressure and temperature change. Tables of vapor pressures for water and several other fluids are available in standard reference books.

The next article of this 3-part series will discuss cavitation of pumps and show how it is related to NPSH.

On-The-Go

SPARTAN Mills in Spartanburg, South Carolina, is a world renowned manufacturer of quality sheetings and broadcloths. At their Beaumont plant they produce coarse fabrics (drills, twills and wide industrial cloth).

A modern installation like Spartan's Beaumont Plant calls for modern materials handling methods capable of varied tasks. Using a combination of 2000 lb and 4000 lb capacity Hyster lift trucks, this progressive mill employs the equipment in handling of cotton bales, rolls of cloth, loom and section beams, bales of flat cloth and looms themselves. All of these handlings are awkward, heavy and formerly required hand labor now released for more productive employment elsewhere.

In the "on the job" photos note particularly the high ceiling warehouses which permit high stacking of bales and section beams. This "free air space" is efficiently utilized, eliminating costly yard or purchased warehouse space.

LEFT — Hyster 2,000 lb and 4,000 lb units team up to make use of valuable "free air space." RIGHT — Bolts of flat cloth weighing 600 lb each are stacked four to six on each 48" x 60" pallet. Five are set on the top pallet to bind the load.

LEFT — Storing bolts of flat cloth. Note efficient use of available warehouse space. CENTER — Loom beams must be transported to other plants. Here a beam is being removed from temporary storage to waiting transport truck. RIGHT — 4,000 lb capacity Hyster lift truck removes roll of cloth from the pile.

Dairyland Power Cooperative, Wisc.
The Franklin Heating Station,
Rochester, Minn.
Kansas City Power and Light Co.
Missouri Public Service Co.
Montana-Dakota Utilities Co.
Pacific Gas & Electric Co.

Central Illinois Public Service Co.
Commonwealth Edison Company
Detroit Edison Co.
Jersey Central Power & Light Co.
Lake Road Station, Cleveland, Ohio
Pennsylvania Electric Co.
Public Service Electric and Gas Co. (N. J.)

NATIONWIDE!

East Side Station, Garland, Texas
Mohawk Station, Tulsa, Okla.
Salt River Power District, Ariz.
Texas Power & Light Co.
Tucson Gas, Electric Light & Power Co.
West Texas Utilities Co.

Carolina Power & Light Co.
Columbus & Southern Ohio Electric Co.
Georgia Power Company
Mississippi Power Company
Monongahela Power Company
South Carolina Public Service Authority

*Central Stations and Utilities use... Graver Deaerating Heaters**

A partial listing of tray and spray-tray type installations with capacities up to 2,250,000 lbs. per hour.

*WRITE FOR MANUAL OF POWER PLANT INFORMATION

A COMPLETE LINE OF WATER TREATMENT EQUIPMENT

GRAVER

Industrial Dept.: I-212

GRAVER WATER CONDITIONING CO.
Division of Graver Tank & Mfg. Co., Inc.
216 West 14th Street, New York 11, N. Y.

Florida Office Building Reduces Water Bill

Saving Water Saves Money

COST of make up water for large dehumidifying or air conditioning installations amounts to a considerable sum. Our monthly water bill was greatly reduced by making the following simple changes:

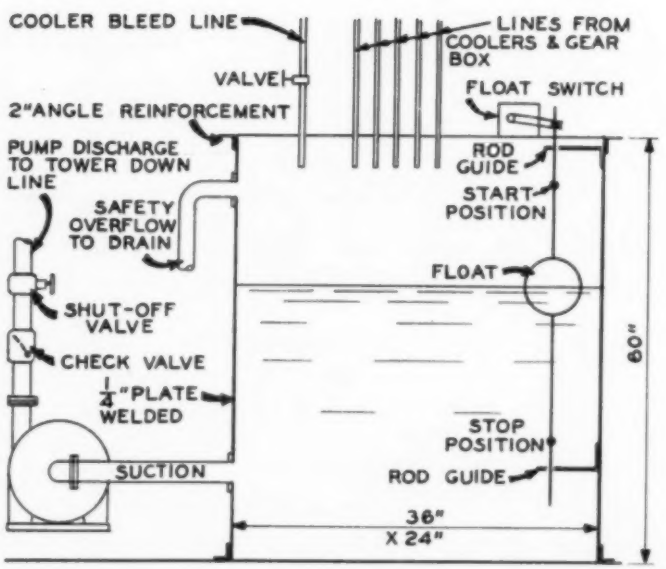
Our two 360 ton centrifugal compressors are electrically driven through a Terry gear unit. The gear box oil is water cooled. Water cooling is also used for the compressor seal, and compressor oil system. As originally installed, city fed water was used in a one pass system, then discharged to the sewer.

Recovery Tank

To capture this waste water a recovery tank was welded together (see sketch). The lines normally discharging this water to the sewer were changed to discharge openly into the recovery tank. The tank was installed near the down line from the cooling tower. A pump assembly, suitable to handle the proper gallonage at required pressure to match our particular system was used (in our case a 3 hp centrifugal pump). This pump is started and stopped by a float switch, actuated by conventional rod and float arrangement in the tank. Suction is from the base of the recovery tank, the pump discharging to the down line of the tower. Capture of this waste greatly cuts down the make up water needed from the normal city supply.

Another source of waste water was utilized by connecting our chilled water system as follows:

Our dehumidifying and cooling is done by the open washer spray method. Many gallons of water per day are taken out of the air, particularly during the summer when humidity is high. At this time our tower evaporation rate is at its highest. Originally this water taken from the air would go to overflow and to sewer. A line was run from one of our coolers to the recovery tank. Rate of blow down flow from cooler to tank can be controlled by hand valve. Between these two sources of water recovery, our make up water to the tower is only a trickle, even on a very hot and humid day.



The water recovered from the cooling system effects another saving. It is very low in chloride concentrations, being near like rain water, making it ideal for injection into the tower system, where chloride concentrations build up, due to heavy evaporation. Very little or no blow down from the tower has been necessary since operating this way.

With the setup as outlined, we also reduce the amount of water treatment used. In our tower and cooling system, the same kind of water treatment is used for protection of condenser and cooler tubes, circulating lines, etc. The water that normally would overflow to sewer from the cooling system was all treated water, carrying many pounds of compound to the sewer with it. Therefore, by capturing this water and injecting it into our tower system, less treatment has to be added to our tower system in order to maintain desired concentrations.

This tank also serves as a handy place to put chemical treatment feeders, as it is near our operating equipment, therefore, supervision is close, which may not be the case if feeders are located in some remote place on the roof.

By KARL A. SYLVESTER, Chief Engineer, Alfred I. du Pont Building, Miami, Florida.

HELP FOR BUYERS

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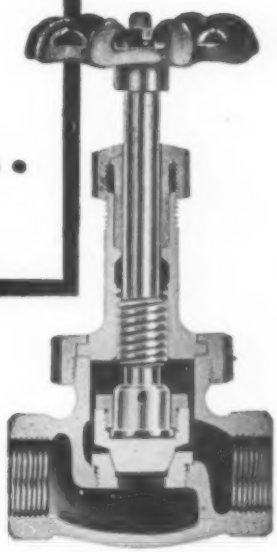
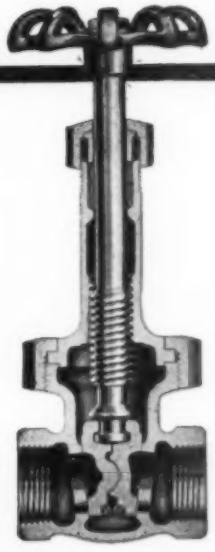
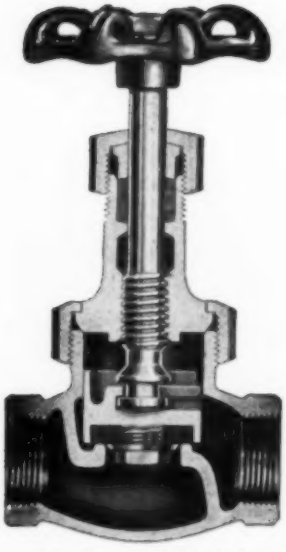
Walworth bronze valves...



Walworth No. 225P Globe Valve
500 Brinell Seat and Disc



Walworth
No. 29 Gate Valve



Walworth No. 95 Globe Valve
Re-New-Disc

built to give dependable trouble-free service on all recommended jobs

Walworth No. 95 Bronze Globe Valves (Angle Type: No. 96) are recommended for service where throttling is not required. They are rated at 150 psi working steam pressure, 500F; 300 psi cold water, oil or gas. The improved renewable disc and lock-on, slip-off disc holder — an original Walworth development—saves time and trouble. This valve can be repacked under pressure when fully opened. All parts are designed to give maximum service and strength.

Walworth No. 29 Bronze Gate Valves are rated at 200 psi working steam pressure, 550F; 400 psi cold water, oil and gas. These valves have rising stems and integral seats. Sizes 2-inch and smaller have union bonnets; sizes 2½ and 3-inch have bolted bonnets. Valves up to and including ¾-inch have solid wedge discs; 1-inch and larger have split wedge discs. These valves can be repacked under pressure when fully opened.

Walworth No. 225P Bronze Globe Valves (Angle Type: No. 227P) are rated at 350 psi working steam pressure, 550F; and 1000 psi non-shock service on cold water, oil and gas. The stainless steel, plug type seat and disc — heat treated to 500 Brinell — can be closed on sand, slag, scale and similar floatage, without injury to the seating surfaces. They are the longest wearing, TOUGHEST bronze valves you can buy.

For full information about Walworth Quality Bronze Valves, see your Walworth distributor, or write:

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60 EAST 42nd STREET NEW YORK 17, N. Y.

Maintenance technique . . .

How to Replace PILOT VALVES

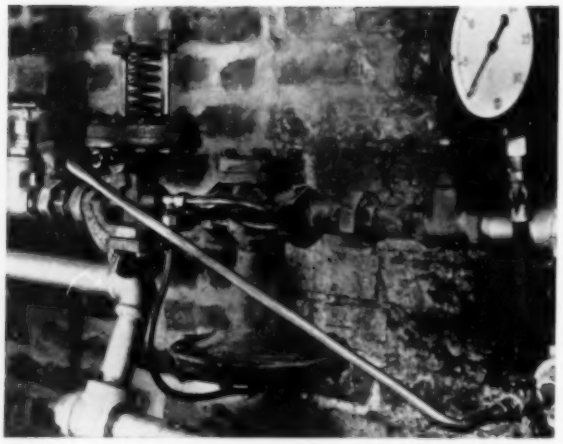


FIG. 1. Close gate valves isolating pilot.

AUTOMATIC control of the flow of gases such as steam and liquids is efficiently accomplished by regulating valves. The main valve is placed in the main line as shown in **Figure 1.** This valve is normally closed. The seat is opened to permit regulated flow by the action of the pilot valve which, in the arrangement shown in Figure 1, is governed by pressure.

In spite of strainers, dirt traps and other preventive measures, pilot valves need cleaning and inspection.

In the group of illustrations is shown the correct technique and ease of removing one pilot valve and replacing it with a new or cleaned one according to engineers of the Spence Engineering Company, Inc., Walden, N. Y.

Notice that the regulator station was well-designed for maintenance. Both the main and pilot valves are accessible and the steam-fitter is not hampered by interfering pipes. Gate valves isolate the pilot and main valves from the flow.

The pilot valve is not enclosed in the housing of the main valve but is external and accessible. The main valve remains untouched. The first step, then, is to close the gate valves isolating the pilot.

The next step is to disconnect the control piping from the pilot **(Figure 2).**

The third step is to obtain a replacement valve, either new or previously cleaned, from the store room shelf **(Figure 3).**

Usually an identical pilot will be installed. However, should it be necessary, because of changes in the system, to change operating pressure of the main valve, a different pilot valve can be selected and installed in place of the old pilot. Pilots are interchangeable on the main valve. Or, if it is necessary to regulate flow accord-

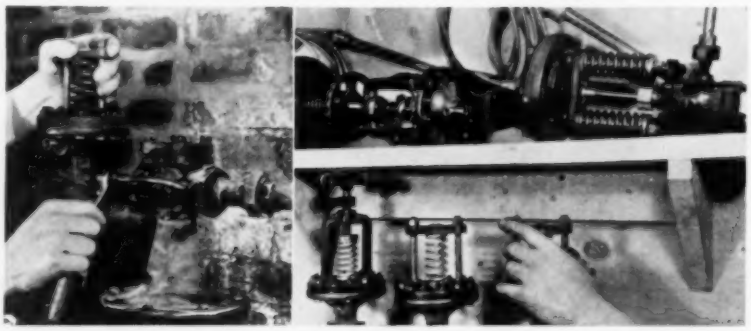


FIG. 2. (left) Disconnect control piping completely freeing the pilot without disturbing the main valve. FIG. 3. Select replacement valve from store room shelf.

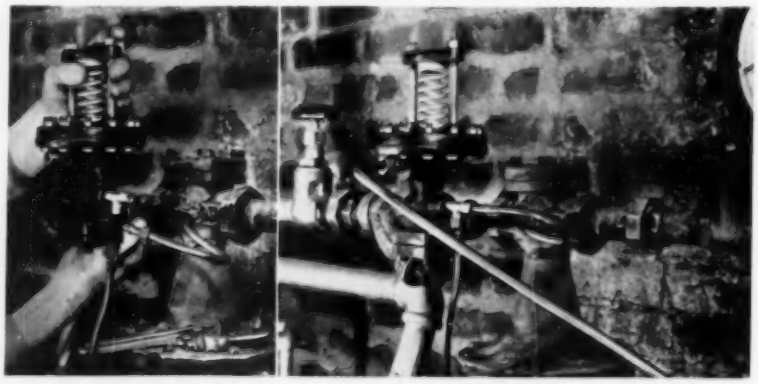
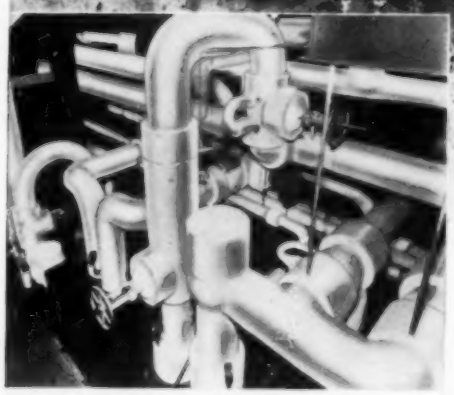


FIG. 4. (left) Install replacement valve by connecting control piping. FIG. 5. System is ready for operation in a matter of minutes without disturbing the main valve. Old pilot can be cleaned and inspected at leisure.

Harness the Energy of Steam with *Pittsburgh Piping*



Pittsburgh Piping installation of high pressure boiler feed piping in central station.

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For more information, use Reply Card—Page 17

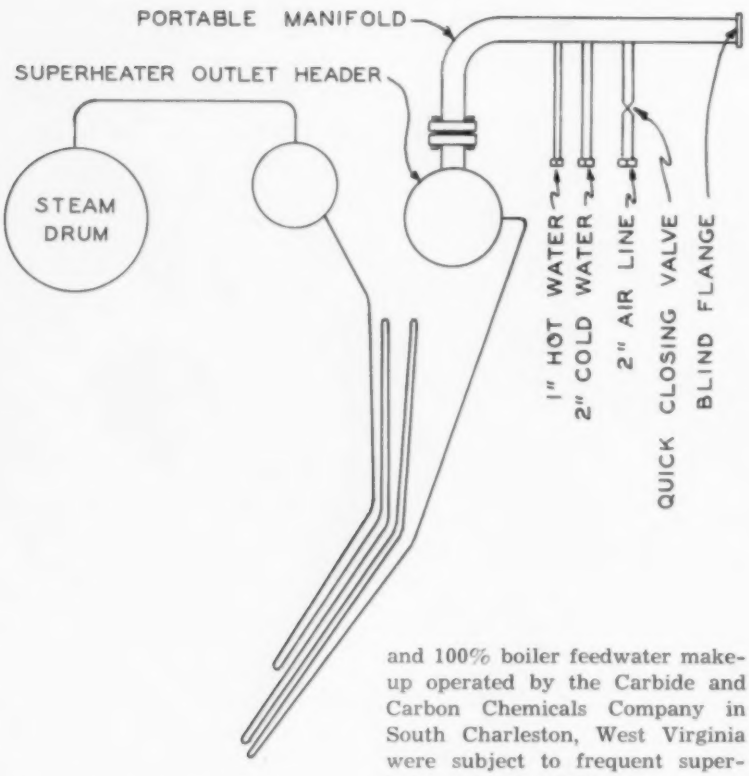
ing to temperature, a temperature pilot with thermostat, such as are shown on the top shelf in Figure 3, can be installed. Temperature pilots are interchangeable also.

Usually without changes in control piping, flow thru the main valve can be controlled as to both pressure and temperature without disturbing the main valve.

The replacement pilot, either identical or for regulation at a different pressure or for temperature regulation or both, is installed by connecting the control piping **(Figure 4).**

The system is ready for operation in a matter of minutes **(Figure 5).** The old pilot can be cleaned and inspected at leisure.

Superheater Washing



HIGH PRESSURE boilers which operate with boiler feedwater supplied on the basis of 100% make-up requires that a thorough internal superheater element washing procedure be established for each boiler outage. Boilers which are equipped with non-drainable superheater elements and with superheater tube ends which are inaccessible through removable handhole plates can make this superheater washing procedure very difficult.

Two 600 psi, 150,000 lb/hr boilers with non-drainable superheater elements, inaccessible tube ends and 100% boiler feedwater make-up operated by the Carbide and Carbon Chemicals Company in South Charleston, West Virginia were subject to frequent superheater element failures.

Cleaning Difficulties

These tube failures were caused from water soluble deposits in the tubes from a slight carryover condition in the boilers. Sometimes the tube failures occurred soon after a boiler was returned to service after an outage. Since the superheater elements have to be washed as a group, some of the elements would become vapor locked and not allow water to circulate through them. The water-soluble deposit will soften in those tubes with poor circulation and drop into the tube turns. This material will then harden during the initial firing procedure and prevent steam circulation with subsequent tube failure.

New Procedure

A superheater washing procedure was developed which not only eliminated the vapor lock in the elements but was also accomplished at reduced expense. A three-inch header was fabricated with connections for a one-inch hot water line, a two-inch cold water line and a two-inch compressed air line. The manifold terminated in a flange which connected to boiler superheater header safety valve connection. The compressed air line connection had a quick closing valve installed in it.

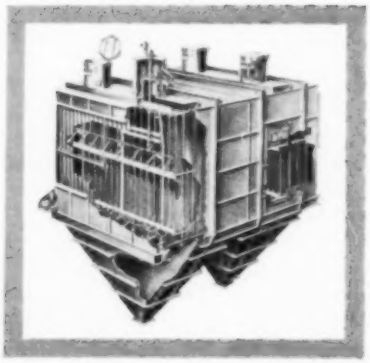
The safety valve is removed from the header, the manifold connected to the header flange and the various service lines connected to the manifold. Hot water at approximately 240 F is first admitted to the manifold to start the washing procedure. The wash water flows backward through the header and elements to the steam drum. While the hot water flows through the elements compressed air at approximately 90 psi is alternately admitted to the manifold. The quick closing valve admits air while the hot water continues to flow.

The purpose of the compressed air is to cause the partially filled vapor locked elements to clear themselves and then start taking hot water. Each of the elements are felt by hand to detect the increase in temperature due to the hot water. After all of the elements are hot they are then washed with cold water in the same manner. After all of the elements are cold the water is allowed to circulate through these elements for fifteen minutes with air admitted occasionally.

This method of washing superheater elements has been in use since April of 1953. There has been only one superheater failure in the form of a small pinhole leak. This leak occurred after the boiler had been in operation for eleven months.

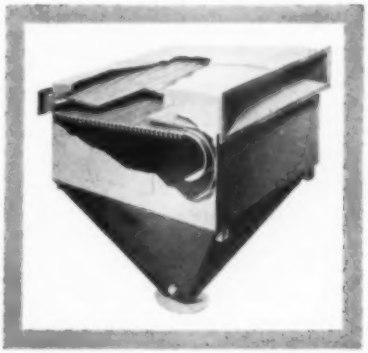
By G. D. BROWN, Carbide and Carbon Chemical Co., South Charleston, W. Va.

How Buell's exclusive Shave-off pays off in extra dust collection efficiency



Buell SF Electric Precipitator also delivers extra dust collection efficiency, due to unique Spiralectrodes and Continuous Cycle Rapping.

Proper proportioning, side entry of dust-laden gases, add even more extra efficiency and long, maintenance-free life to Buell Cyclones. Large diameter design eliminates bridging and clogging, keeps efficiency high under varying loads.



Buell Low Resistance Fly Ash Collector combines top efficiency with low draft loss, for either natural or mechanical draft installations.

For more specific data about Buell's *extra efficiency*, write Dept. 80-L, Buell Engineering Company, 70 Pine Street, New York 5, N. Y.

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MECHANICAL ELECTRICAL *Experts at delivering Extra Efficiency in* **DUST COLLECTION SYSTEMS**

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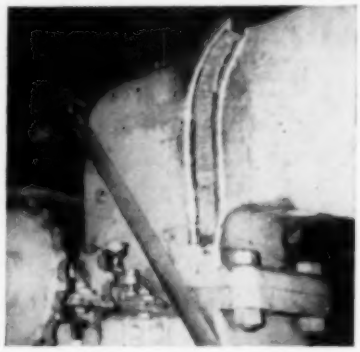
Housing Break Welded in Place

A THREE thousand dollar savings was made for Helvetia Sugar Company of Gonzales, Louisiana by welding a large broken housing in place. The price of a new casting approximated $3,500, to which would have to be added the cost of tearing down the equipment and rebuilding it. The cracks were welded in place for less than $150.



The big break after welding.

Being in the welding business, I am more interested in why and how it was possible to do so big a repair job for $150 than in the fact of its having saved a $3,500 replacement.

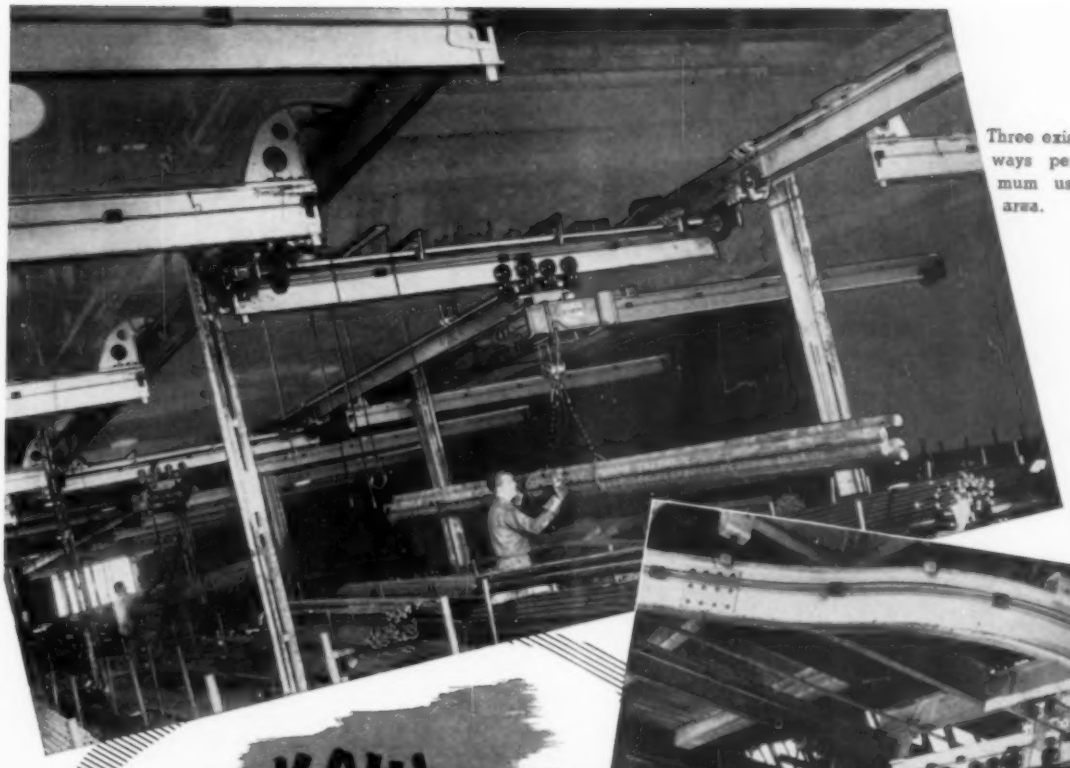
Low Heat

The biggest factor in the low cost of the welded repair, actually, was avoiding having to disassemble the equipment, but also not having to preheat the housing was important.

With modern low - amperage electrodes, such savings are vastly more possible than they were just a few years ago. There is less heat put into the work, therefore less possibility of warpage, locked-up stresses and the like . . . such as require the safeguards provided by preheating and controlled after-cooling.

Technique

The work, in this instance, required a total of 40 hours of labor, but it was programmed over ten days, thus affording plenty of time between passes for the housing to cool. The electrode used was All-



Three existing craneways permit maximum use of floor area.

new MONORAIL ties into old... for flexible system

New MonoRail section of versatile up-and-over system.

A newly engineered section was added to three existing MonoRail craneways in this bar stock warehouse. As a result, incoming material can be picked up from a car and transported on this highly efficient overhead system to storage area. When the raw stock is needed, this up-and-over system has it there on schedule. If you have a materials handling problem, call your nearby American MonoRail engineer. He is qualified to help you answer it.

Member of Materials Handling Institute - MonoRail Association

Photos courtesy of Super Steels, Inc., Chicago, Ill.

AMERICAN OVERHEAD HANDLING EQUIPMENT MONORAIL COMPANY

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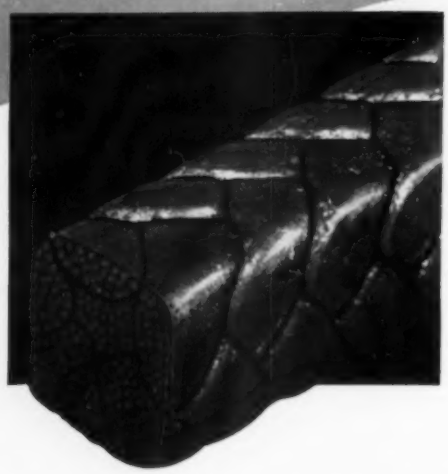
BELMONT "Centrifugal"



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Belmont Type 754-P is a "custom made" packing for centrifugal and rotary pumps. Its reputation as "nothing better for the service", has been gained through years of highly satisfactory performance.

Secret of success? *Lubrication* that allows shaft free motion. Lubrication that is impregnated into every strand of asbestos yarn, and graphiting that is braided into this packing to stay, throughout its life.

Try Belmont "Centrifugal" 754-P in your plant and keep a check on the condition of your pump shafts. You'll stay with it.

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State Welding Alloys Co.'s No. 6 High Strength Non - Machinable Cast Iron. It was applied with d-c reversed polarity at 100 amps. The job in its entirety consumed 35 pounds. Good fusion was obtained with 20 volts. Arc length was maintained at about 1/16".

Since the weld was made with the housing in place, there was no possibility of doing an adequate preliminary cleaning job. The casting was grease soaked and dirty. In preparing the cracks for welding, therefore, we chamfered with a high speed rod at 200 amps, using a motion very like routing out wood with a hand chisel, always moving forward to avoid unnecessary heat concentration. With fast action we obtained a clean bright groove in a very few minutes of time. Then we clamped the housing into alignment and were ready for the first welding pass.

In March, 1955 the Chief Engineer of the sugar plant and I concluded that the housing we had just repaired was in every way as good as a new one. That it was better than that particular one had been when it came from the foundry was obvious. Now a year has passed (another grinding season has gone by) and there is no evidence that the housing will ever again be a source of trouble.

By ROBERT NORDIN, Regional Manager, All State Welding Alloys Co., New Orleans, La.

Portable Power Turns Valves

USE OF a McCulloch No. 99 earth drill, which has a lightweight air-cooled engine (such as used on chain saws) to turn off and on water main valves, has saved Kansas City, Mo., many man-hours.

A portable engine such as used on the earth drill is caried on each truck and two men operating the earth drill hookup can turn a big valve on or off in about 5 minutes. City Engineer Frank Weis figured out the time-saving arrangement and purchased two earth drills as a starter.

News for the South & Southwest (Continued)

(Starts on Page 8)

Edison—Atlanta

The appointment of **Stuart E. Womeldorph** as Atlanta district manager for the **Edison Storage Battery** division of Thomas A. Edison, Inc., has been announced by George E. Stringfellow, vice president and division manager, at West Orange, N. J.

Mr. Womeldorph, a native of Washington, D. C., has for several years represented Edison in Birmingham, Ala. Prior to that he was an Edison representative in Charlotte, N. C., and in the Washington District.

He succeeds Eugene L. Krauss, who has resigned.

Mr. Womeldorph came to Edison after four years in the Army, where he rose to rank of Captain in the coast artillery. He is a graduate of Virginia Polytechnic Institute and took graduate work at the University of Maryland.

Cambar—PVC Pipe

Polyvinyl Chloride Plastic Pipe is now being stocked by **The Cameron & Barkley Co., in Charleston, S. C., Savannah, Ga., Jacksonville, Tampa, Orlando** and **Miami, Fla.**

This new PVC Pipe, as produced by the National Tube Division, U. S. Steel Corporation, is one-half the weight of aluminum, highly chemically resistant, can be cemented, welded, machined, sawed or threaded, and will not rust, rot or leak. Its corrosion resistant qualities, lightweight and durability offer tremendous savings in installation, transportation and maintenance costs.

Granger Heads U-T College of Engineering

A. T. Granger, head of the **University of Tennessee** civil engineering department and a nationally-known specialist on bridges, is the new dean of the U-T College of Engineering.

Tennessee's "Mr. Engineer," N. W. Dougherty, who has reached the compulsory retirement age of 70, has become "Dean Emeritus." Both appointments were made at a recent meeting of the U-T Board of Trustees' executive committee.

Professor Granger follows in the footsteps of Dean Dougherty, having taken over the civil engineering department in 1940 when Dougherty vacated that post to become dean, and now succeeding Dougherty in the deanship.

A specialist on complicated or unusual structures, Professor Granger is chairman of the national committee which arranges programs for the structural division of the American Society of Civil Engineers and is the only southern educator on the American Railway Engineering Association's important "Committee 30 — Impact and Bridge Stresses."

He has just completed, at request of the publishers, the section on steel bridges in the forthcoming three-volume "American Civil Engineering Practice" which will replace a long-standing reference book for civil engineers.

Associated with a large bridge consulting firm before joining the U-T staff, the incoming dean has supervised drawings for some of America's outstanding bridges. He has continued to serve at various times as a consultant on buildings and bridges both in Tennessee and elsewhere.

He was president last year of the Tennessee Society of Professional Engineers and is a former president of the Tennessee Valley Section, American Society of Civil Engineers.

Allis-Chalmers—Charlotte

R. H. Cline, formerly manager of **Allis-Chalmers** Charlotte district, has been appointed manager of the Pittsburgh district of the company's Industries Group. He succeeds **J. K. Keogh,** who continues as a special representative reporting to V. L. Spinney, manager of the Central Region.

Cline, who is succeeded as Charlotte district manager by **C. B. Rumble, Jr.,** joined Allis-Chalmers in 1946 as a representative in the Atlanta district. He was named manager at Charlotte in 1952. He is an electrical engineering graduate of Duke University.

Rumble has been a representative in the Allis-Chalmers Philadelphia district since 1946. He is a mechanical engineering graduate of Purdue University.

Sharples—Houston

Oren E. Hopkins, Jr. has been appointed sales engineer in the **Houston, Texas** district by **The Sharples Corporation,** Centrifugal and Process Engineers, Philadelphia, Pennsylvania.

Mr. Hopkins previously served in the Engineering Service Division of E. I. du Pont de Nemours.

Rockwell—Georgia

Ralph A. Purcelli, former assistant general manager of Rockwell Manufacturing Company's gas regulator plant at Norwalk, Ohio, has been named general manager of the new **Rockwell** plant at **Statesboro, Georgia.**

A native of Pittsburgh, Mr. Purcelli joined Rockwell in 1936, became general foreman of the Nordstrom valve department at Pittsburgh in 1943, general foreman of meter and regulator assembly in 1950, general superintendent of the Barberton, Ohio, valve plant in 1951 and assistant general manager at Norwalk in 1954.

Subox paints are based on suboxide of lead, a most effective anti-corrosive agent. They are the only paints made in America using this chemically-active, finely-dispersed pigment that spreads smoothly, evenly, thoroughly, adheres closely and endures for many years.

Very often two coats of Subox replace three coats of standard paints, and frequently, even one coat is sufficient, especially as Subox* and Subalox* come in many attractive colors and serve as primers as well as finishing coats, or can be applied over conventional primers.

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See Catalogues in Sweet's Industrial and Engineering Files

American Air Filter— Executive Changes

Three executive changes in home office personnel have been announced by W. G. Frank, president of **American Air Filter Co., Inc.** A new administrative Central Staff has been established with **Robert W. Nelson**, vice president, as director. He is currently executive assistant to the director of sales. His duties will include assisting general management with the administration and coordination of the activities of all of the divisions and subsidiaries of AAF.

John Hellstrom, vice president and director of sales, will acquire the administration of the American Air Division (Louisville Operating Division) in addition to his other duties. This was formerly performed by W. G. Frank.

James W. May has been appointed director of technical training. One of his first responsibilities will be to establish a training course to provide personnel for future sales, technical and supervisory positions in the company.

Lamson Corp. Changes

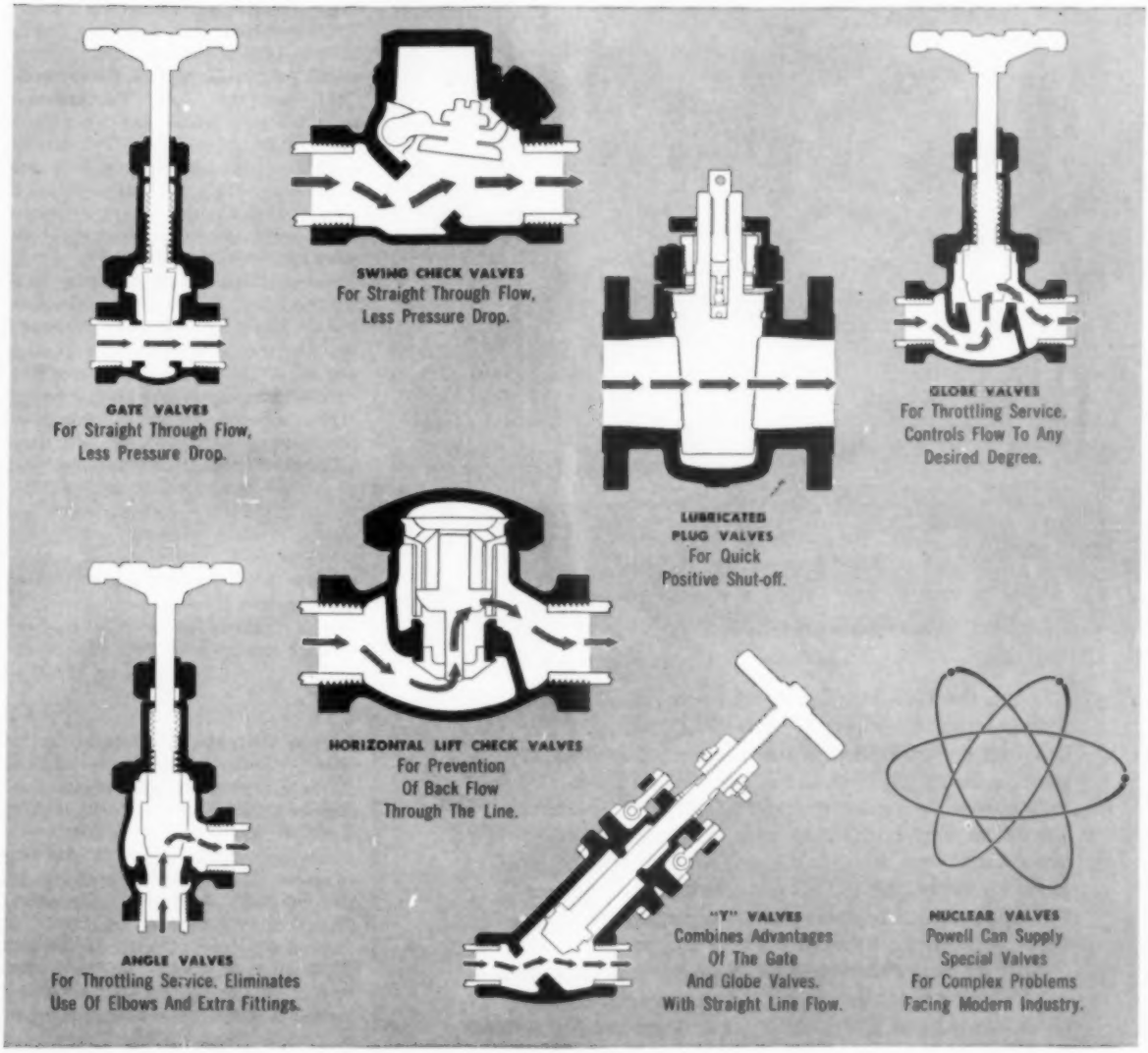
Robert I. Hicks, President of **Lamson Corporation**, Syracuse, New York, operating subsidiary of Lamson Corporation of Delaware, has announced an important change in the organization structure of the Corporation.

Under the new plan, the Company will have two separate Sales and Engineering groups — Engineered Systems and Allied Products.

Carroll Hennessy, newly elected Vice President, will manage the **Engineered Systems.** In his new position he will be responsible for the sale, engineering and installation of all systems generally sold through Lamson's own field force. The Group's products are divided into two groups: Industrial Systems — Automatic Pallet Loaders and Industrial Conveyors, and Commercial Systems — Airtubes, Commercial Conveyors, Food Service Conveyors and Trayveyors.

Allied Products will be managed by **Vernon C. Story** and will include Blowers, Drysets, Erecto Conveyors, and Packaged Airtubes. He will have the control of sales and engineering for these product lines which are distributed principally through agents and dealers.

POWELL
for all valve needs



for every flow control problem there is a right Valve

Powell can supply this right valve—*made right* of the right material*. Every part of every valve must pass rigid inspection. And as a final step in manufacture, every Powell Valve has *Performance Verified* through an *actual line test.*

As an aid in selecting the right valve, the basic valve designs are illustrated here. For complete information on the wide range of sizes and materials available in each type of the basic valves illustrated above, consult your Powell Valve distributor. If none is located near you—or if you have a special flow control problem—write direct to The Wm. Powell Company, Cincinnati 22, Ohio.

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POWELL VALVES

*BRONZE, IRON, STEEL AND CORROSION RESISTANT VALVES.

. . . and the P-D Tubular is even more radical. Unique internal ducting, called *PLENAFLO, actually provides a plenum *within* the collector casing which permits direct gas flow to the inlet of the tubes *unhampered by a maze of outlet tubes.* It also permits the use of tube bundles so designed that the gas *never has to pass more than two tubes* to reach the most isolated central tube. This patented feature reduces resistance and eliminates gas recirculation that can occur with outlet tubes of varying length.

Further improvement of gas flow was accomplished by designing the tube inlet slots to permit the gas to enter the tube at a natural angle and around the complete periphery of the tube. This reduces sudden changes in direction of gas flow and attendant wear.

Ask our project engineers for information on this unique PLENAFLO collector. Its efficiency and limited space requirements will be of particular interest. Available in either vertical or horizontal tube design sheets, it assures installation flexibility.

Write today for Bulletin on this radical design.

*Trademark

Project Engineers
THE THERMIX CORPORATION
GREENWICH, CONN.
(Offices in 38 Principal Cities)
Canadian Affiliates: T. C. CHOWN, LTD., Montreal 25, Que.

pd

Designers and Manufacturers
PRAT-DANIEL CORPORATION
SOUTH NORWALK, CONN.

POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks

News (Continued)

Bituminous Coal Research

Two appointments have been made to the staff of **Bituminous Coal Research, Inc.,** the national research association for bituminous coal, by Dr. A. A. Potter, BCR president. One has been assigned to the Columbus, Ohio, laboratory as a project engineer and the other to the Pittsburgh, Pa., laboratory as a chemical engineer.

Robert D. Saltsman, formerly resident mining engineer for Youngstown Mines Corporation, Dehue, W. Va., was employed as a project engineer. He is currently working on coal-burning equipment sized for commercial and small industrial application.

Robert W. Stephan was employed as a chemical engineer at the Pittsburgh laboratory and has been assigned to the projects concerning bench-scale investigations of catalytic gas phase oxidation of sulfur dioxide, and the survey and evaluation of methods for controlling sulfur dioxide emission in flue gases.

Parker Distrib.—Houston

Appointment of **Hydraquip Corporation,** 6645 Navigation Boulevard, Houston 11, Texas, as distributor of Parker tube and hose fittings and tube-working tools is announced by the **Parker Appliance Company,** Cleveland, Ohio.

According to **Frank H. Smith** and **C. W. McNeill,** owners of Hydraquip, stocks of Parker products will be maintained for prompt servicing of customer requirements throughout the important industrial Gulf Coast area.

Iron Fireman Sales Mgr.

Appointment of **Howard M. Cutshaw** as general sales manager for **Iron Fireman Manufacturing Co.'s** heating equipment has been announced by Lewis J. Cox, vice president and manager of the heating division.

In his new position, Cutshaw will direct sales activities of Iron Fireman domestic, commercial and industrial heating and power equipment, and air conditioning.

Acme Steel Acquires Newport Steel Corp.

Acme Steel Company, under the provisions of a purchase agreement with **Newport Steel Corporation,** Newport, Kentucky, has consummated the deal and taken possession of the property and assets of the former Merritt-Chapman & Scott subsidiary.

Newport as a wholly owned subsidiary of Acme Steel Company will be operated as a new Illinois corporation under the name of **Acme-Newport Steel Company.** Present Newport Steel management will continue to administer the business with **A. P. Miller** as Vice President and General Manager, and **Carl M. Riefkin** as Vice President in Charge of Sales.

The consolidation of the two companies brings many advantages to each, and holds promise for more flexible application of their combined facilities to better serve the users of specialty steel products throughout a broad range of industries.

Florida Utilities to Build Atomic Plant

A major atomic power plant project is being undertaken jointly by Florida's three largest electric utility companies, which are laying plans for "the design, construction and operation of a large-scale nuclear power plant," according to a joint announcement made in Florida.

The three companies, **Florida Power & Light Company,** of Miami; **Tampa Electric Company,** of Tampa; and **Florida Power Corporation,** of St. Petersburg, have entered into an agreement with **Allis-Chalmers** Manufacturing Company and **The Babcock & Wilcox Company** looking to a target date of 1962-63 for the construction and operation of a "major power plant using atomic energy for fuel, to be located at an appropriate site within suitable transmission distance of all three Florida companies."

The three-company agreement looks to Babcock & Wilcox and Allis-Chalmers, who are also parties to the agreement, for technical know-how, design and manufacture of the major equipment.

It is also contemplated that **Stone & Webster Engineering Corp.** shall be associated with the project in connection with the plant's final layout and construction.

DON'T BLOW YOUR TOP!

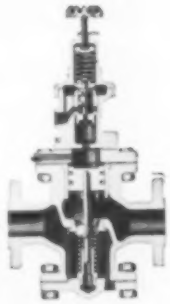
INVESTIGATE
FOSTER
RELIEF VALVES

LOOKING FOR A PRESSURE RELIEF VALVE TO DO A SPECIAL JOB? CHANCES ARE FOSTER HAS JUST WHAT YOU NEED.

FOSTER Automatic Pressure Relief Valves are designed for industrial, power plant and marine applications requiring dependable, adjustable non-pop type of control, relieving excess pressure into a lower pressure system or to atmosphere.

Foster valves are built to last. They are designed to provide continuous protection and control of pressure for years of trouble-free service. Foster assures long-life by using materials suitable for specific operating conditions; bronze, stainless steel alloys and various types of trim are available.

Valves are designed with diaphragm or piston actuation depending upon the required services and regulations.



The Foster R-4 Relief Valve shown here is spring loaded, adjustable, with an internal pilot operated main valve. Single seated, tight closing and suitable for dead end service, it is designed for general service where practically instantaneous relief is required of the excess pressure with minimum build-up.

R-4 is only one of many standard Foster Relief Valves for all operating conditions and services.

For address of nearest Foster Representative, consult your Red Book, or get in touch with us direct, ask for Bulletin R101

FOSTER AUTOMATIC VALVES

FOSTER ENGINEERING COMPANY
835 LEHIGH AVENUE, UNION, N. J.
- AUTOMATIC VALVES
- CONTROL VALVES
- SAFETY VALVES
- FLOW TUBES

GOULDS PUMPS, INC., Seneca Falls, New York

Check bulletins you'd like to receive:

☐ Pump Fundamentals. A brief outline of the characteristics, operation and criteria for selecting reciprocating, rotary, and centrifugal pumps.

☐ 710.1 "Close-cupld" Centrifugal Pumps.

☐ 721.6 Single-stage Double-suction Pumps.

☐ 725.4 Centrifugal Chemical Pumps.

☐ 726.1 Vertical Centrifugal Pumps.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

How to buy a better pump

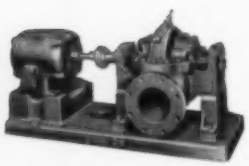
When you have to choose from dozens of pumps of different types and brands, it's hard to tell which will work best for you at the least cost.

However, when you know what to look for and how to look, you can match a pump to your needs almost exactly.

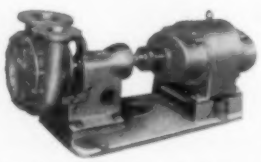
Just five of hundreds of bulletins we've prepared to help you buy wisely and well are offered above. Send for them and use them when you need a general purpose pump.

When you have a particular application in mind, write us the essentials. We'll be glad to advise you on the pump or pumps that will work best for your purpose.

4 general purpose pumps

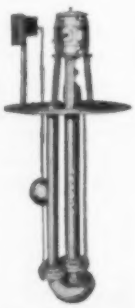


1. For large capacity pumping, the Goulds Fig. 3405. 33 sizes with capacities up to 6400 GPM; heads to 425 ft. Send for Bulletin 721.6.



2. For economical handling of hot, corrosive or abrasive liquids, the Goulds Fig. 3715 stainless steel pump. 9 sizes with capacities up to 720 GPM; heads to 200 ft. Send for Bulletin 725.4.

3. For use where space is at a premium, the Goulds Fig. 3655 "close-cupld" pump. 20 sizes with capacities up to 2000 GPM; heads to 400 ft. Send for Bulletin 710.1.



4. A submerged-type sump pump for depths of 3 to 20 ft., the Goulds Fig. 3047. 4 sizes with capacities from 10 to 650 GPM; heads up to 65 ft. Send for Bulletin 726.1.

MEMBER HYDRAULIC INSTITUTE

Goulds PUMPS INC. Seneca Falls New York

SALES OFFICES: Atlanta • Boston • Chicago • Houston • New York • Philadelphia • Pittsburgh • Tulsa

H L & P Expansion

Orders have been placed by the **Houston Lighting & Power Company** for the third generating unit to be installed at the **Sam Bertron Station** located on the Houston Ship Channel near the San Jacinto Monument. It is scheduled to go into service in the spring of 1959.

The G-E turbine-generator is of the conductor-cooled type and will be the first of its kind on the Houston System as well as being the largest. It will have a name plate rating of 200,000 kw and is expected to have a maximum capability of 240,000 kw, which is 45% larger than the existing 165,000 kw units. Steam conditions at the turbine are 2000 psig and 1000 F reheat. This liquid cooled unit will not only be the largest on the Houston System but also the largest in Texas and one of the largest of its kind (single shaft) in the nation.

In addition to the unit just placed on order, the Houston Lighting & Power Company has three other large units under construction. These are the second unit at Sam Bertron and the first two units at the new Smithers Lake Site. The Sam Bertron unit is rated 156,250 kw and will have a capability of 165,000 kw. It is scheduled for completion early in 1958 and is a duplicate of the first installation at the site which went into service in March, 1956. It consists of about 3900 acres and is centered about Smithers Lake, an artificial fresh water lake with a surface area of about 1400 acres.

Laclede-Christy—Houston

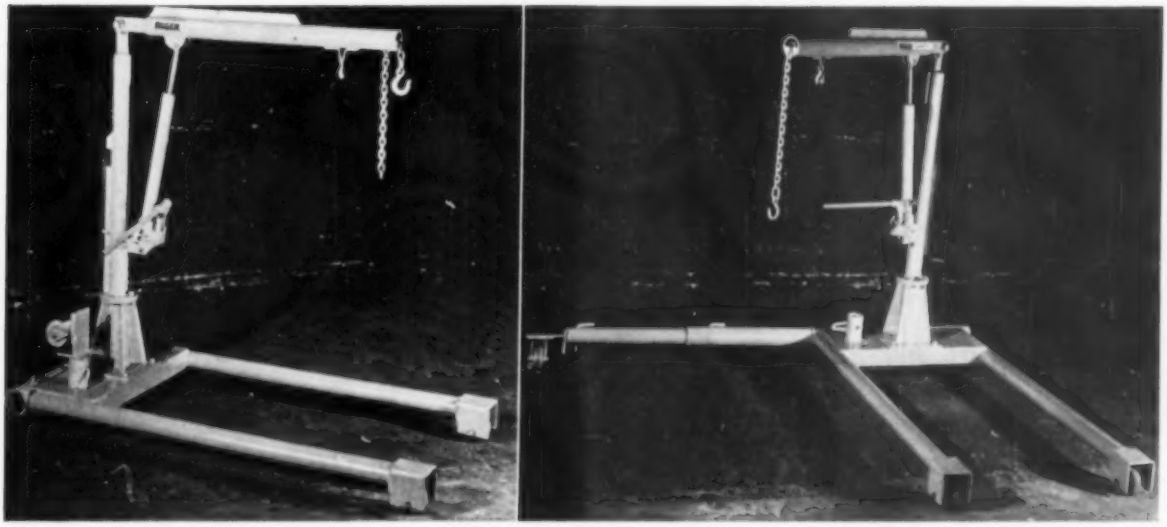
Robert N. Smaistrla has been appointed Houston District Sales Manager for the **Laclede-Christy Company Division**, H. K. Porter Company, Inc. His territory includes southern sections of **Texas** and **Louisiana.**

Mr. Smaistrla is active in the Petroleum Branch of the American Institute of Mining and Metallurgical Engineers and is a member of their membership committee. He is an active member of the American Petroleum Institute, a member of the American Society of Mechanical Engineers, and a registered professional engineer in the State of Texas.

Mr. Smaistrla was graduated from Rice Institute with a Mechanical Engineering degree and served with the United States Air Force 1942 through 1945.

Equipment . . . Supplies . . . Methods

FOR FREE INFORMATION — Circle Code Number on Page 17 Return Card



Portable Floor Crane Has Swing-Around Boom

M-1 A new quarter-ton capacity portable hand-operated hydraulic floor crane is being manufactured by **Ruger Equipment, Inc.**, 615 West Fourth St., Ullrichsville, Ohio.

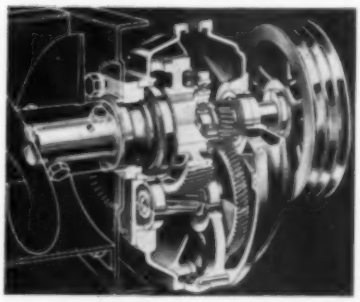
A telescopic outrigger can be extended to either side of the unit to offer stability, and the crane's boom can be unlocked from its usual position of alignment between the crane's legs and swung to the side a full 90°. This allows the crane to reach loads previously inaccessible on account of having the legs obstructed by the base of the machine the load rests on. Also this feature allows the crane to work in extremely narrow aisles.

The crane has a rated capacity of 500 lb and is equipped with a self contained hydraulic system incorporating an overload relief set at 700 lb. The unit is completely portable and turns in its own length. It is only 65" long and 33" wide, with the outrigger closed. With outrigger extended, the width of the unit becomes 83". The boom has a vertical travel of 68".

Screw-King Drive

M-2 A new speed-reduction unit especially designed for screw conveyor applications has been introduced by **The American Pulley Company**, 4200 Wissahickon Ave., Philadelphia 29, Pa.

The American Screw-King drive is a compact speed-reduction unit with a flange adaptor that permits bolting directly to the trough end of a screw conveyor. The output shaft fits into the end of the pipe of a standard 6", 9" or 12" screw having a bore of 1½, 2, 2 7/16". The input shaft of the unit is driven from a motor of any make, any type, any age by a short center V-Belt drive.



The unit retains the basic design approach of American's successful Shaft-King speed-reducer but has five additional features built into it—a direct drive shaft for the screw conveyor, eliminating the need for a separate drive-end shaft; the drive shaft support bearings are an integral part of the Screw-King unit, eliminating the requirement of a drive-end bearing otherwise necessary; a double purpose, highly efficient, dust seal eliminating the need for an auxiliary seal ordinarily used when dusty material is being conveyed; high capacity to absorb screw conveyor thrust loads; and outstanding compactness.

The Screw-King is made in three sizes from ½ to 10 hp and each with three reduction ratios, 5 to 1, 13 to 1, and 20 to 1.

Maintenance Coating

M-3 **Metal & Thermit Corporation,** 100 Park Ave., New York 17, N. Y., has introduced a new vinyl maintenance coating—Ucilon Coating 1400 — that provides the remarkable corrosion resistance of previous vinyl-based coatings but eliminates strong odors and the need for meticulous surface preparation.

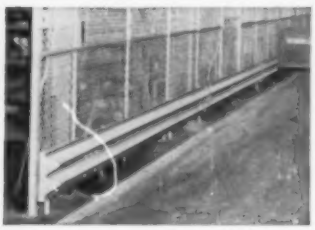
Ucilon 1400 resists acids, alkalies, water and other causes of early paint failure. It can be used for walls, floors, ceilings and the exteriors of equipment to resist corrosive fumes in chemical processing plants and other industrial atmospheres.

The new coating is self-priming and brushes out like oil paint with no sagging or dripping. It can be applied over bare metal, wood, masonry and most previously painted surfaces without special surface preparation.

Its mild odor and high flash point (105 F) permit application without interference with plant routines. Users may choose from six colors to combine good appearance with a durable protective coating.

FLEX-BEAM GUARDRAIL IMPROVES PLANT SAFETY

Armco Guardrail protects employees and plant property at low cost



Inside this plant, Armco FLEX-BEAM Guardrail protects the tool crib from damage by passing intra-plant trucks.

In this company parking lot, Armco FLEX-BEAM Guardrail defines parking areas while conserving space.

Armco FLEX-BEAM Guardrail is a deeply corrugated, beam-type, all-steel guard. It promotes safety, protects employees and plant property.

INSIDE PLANTS Here, FLEX-BEAM protects vital and costly equipment from damage by in-plant trucks and dollies. Along walkways this sturdy guardrail prevents encroaching vehicles from injuring employees.

IN PARKING LOTS Armco FLEX-BEAM defines parking areas and makes room for more autos. And orderly parking reduces chances for damaging bumps and scrapes.

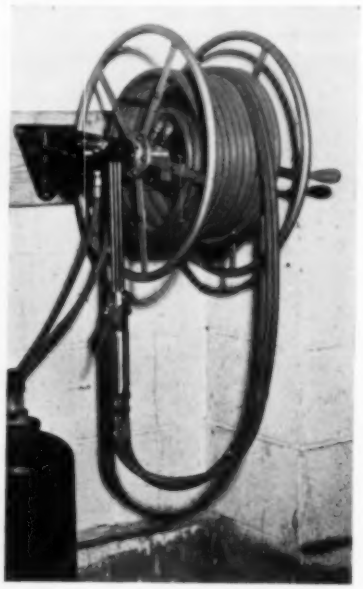
Sections of Armco FLEX-BEAM Guardrail are simply bolted together and attached to posts or building structural members. Installation costs are low. Write us for more data.

ARMCO DRAINAGE & METAL PRODUCTS, INC.
DIXIE DIVISION
619 Forsyth Building • Atlanta, Georgia
SOUTHWESTERN DIVISION
C&I Life Building • Houston, Texas
Other Offices in Principal Cities

ARMCO

Hose Reel Assembly

M-4 Model A-8 Oxy-Acetylene Hose Reel, designed by **Hardie Engineering Co. Inc.,** 3362 Shenandoah Ave., N. W., Roanoke, Va., is a handy, economical and safe storage place for hose.



Weighing only 17¼ lb without hose, it is still sturdy enough to hold 150 ft of ¼" twin Oxy-Aceylene hose. It may be permanently mounted on any strong surface, or by using the cylinder truck adapter it can be mounted on any piece of one inch O.D. Pipe.

Space Heaters

M-5 Seven additional improvements stressing even safer operation and simplier controls are featured in the 1957 line of Herman Nelson Portable Space Heaters, manufactured by **American Air Filter Co., Inc.,** 215 Central Ave., Louisville 8, Ky.

The new line includes both oil and gasoline fired units in capacities from 50,000 to 450,000 BTU per hour. The low-cost "Thrifty" model is powered with a 1/3 hp electric motor. The "Utility" model features optional power plants, quickly interchangeable between gasoline engine and electric motor. The "De Luxe" is an all-automatic unit with optional, remote temperature control.

Equipment, Supplies & Methods (Cont'd)

Water Gage for High Pressure Boilers

M-6 Brilliant two-color red and green readings and greatly reduced maintenance are two of the outstanding features of the new Yarway Color-Port Water Gage announced by **Yarnall-Waring Company,** Mermaid Lane, Philadelphia 18, Pa.

Yarway Color-Port Water Gages are designed for high pressure boilers, up to 3300 psi.

In the port-type openings, water shows green, steam shows red. Thus, a full gage is all green, an empty gage all red.

The individual cover-glass assemblies permit quick and essy servicing of the gage in place, without removal from the boiler.

Large diameter port openings give increased visibility, and a variety of mirror arrangements bring the brilliantly lighted, head-on view of the gage face to convenient operating-floor locations.

Slip-On End Caps Protect Piping

M-7 Here's an economical way to guard pipe and tubing against costly internal corrosion during storage. **Protokap, Inc.,** 625 W. Bldg., Houston, Tex., is now offering slip-over and roll-on end caps made of neoprene that

GOT A PUMPING PROBLEM?

PERHAPS THE ANSWER YOU'RE LOOKING FOR IS A ROPER ROTARY PUMP

ROPER PUMP-MOTORS

These units offer low-speed and high-torque, and their versatility finds them well-suited to heavy-duty service within their operating range. In general, recommended speed is 200 to 800 R.P.M. with pressures to 800 P.S.I. In this range, they require from 7 to 40 G.P.M. flow and will develop up to 11.5 H.P. output at maximum speed and pressure.

ROPER SERIES F PUMPS

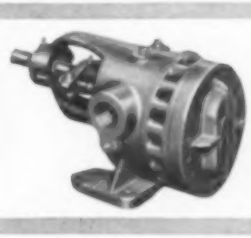
Among the dependable Ropers is the Series F Pump — pressures to 300 P.S.I., sizes 1 to 300 G.P.M. It features four-port design with 8 optional piping arrangements . . . supplied in standard fitted models. With packed box or mechanical seal; with or without relief valve.

ROPER SERIES K PUMPS

Operate your hydraulic circuit with the correct size Roper for the particular job. In many cases the Series K will do, for it is rated from pressures to 150 P.S.I., capacities ¾ to 50 G.P.M. This model is compact, sturdy . . . is self-lubricated by liquid pumped. Comes with packed box or mechanical seal . . . with or without relief valve.

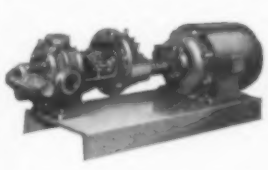
ROPER SERIES H PUMPS

Lower maintenance costs with a Roper. For instance, a pump like the Series H with pressures to 1000 P.S.I., sizes 10 to 75 G.P.M. is ideally suited for hydraulic mechanisms and for other applications requiring high pressures. Spur gears run in axial hydraulic balance . . . roller bearings and bronze wear plates reduce friction. Available with packed box or mechanical seal.



ROPER SERIES 3600 PUMPS

You'll profit more with dependable Roper Series 3600 Pumps on the job . . . they are speedy, quiet, and plenty rugged. Service-proved features such as self-lubrication, adjustable relief valve, hardened gears, and mechanical seal contribute to Roper dependability. Sizes range from 40 to 300 G.P.M.; pressures to 60 P.S.I.



GEO. D. ROPER CORP., 442 BLACKHAWK PARK AVENUE, ROCKFORD, ILLINOIS

SEND NOW FOR DESCRIPTIVE BULLETINS

ROPER Rotary Pumps

install VOSS VALVES in your compressors for peak performance

(AIR • GAS • AMMONIA)

Our detailed proposal for improving efficiency of your compressor will be sent without obligation. Send name, bore, stroke, and speed of machine.

Peak performance, maximum efficiency, greater output, and lower power costs can be built into your oldest, and of course your newest, compressors by the installation of VOSS VALVES.

Check THESE VOSS VALVE ADVANTAGES:

✓ Quiet, vibration-free operation ✓ 20 to 60% more valve area
✓ less power consumption ✓ minimum pressure loss ✓ utmost safety
✓ normal discharge temperature ✓ lower operating costs

VOSS VALVES REG. U.S. PAT. OFF.

J. H. H. VOSS CO., INC.
785 East 144th St., N. Y. 54, N. Y.

for

BIGELOW ★
BADENHAUSEN ★
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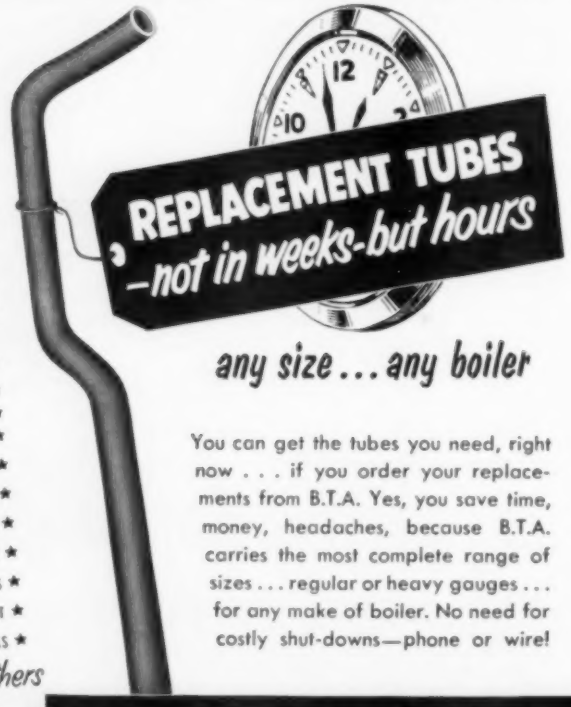
and others



REPLACEMENT TUBES
—not in weeks-but hours

any size . . . any boiler

You can get the tubes you need, right now . . . if you order your replacements from B.T.A. Yes, you save time, money, headaches, because B.T.A. carries the most complete range of sizes . . . regular or heavy gauges . . . for any make of boiler. No need for costly shut-downs—phone or wire!

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2A

BOILER TUBE CO. OF AMERICA
McKEES ROCKS, (PITTSBURGH DISTRICT) *Federal 1-7750*

effectively seal out air, moisture, corrosive fumes, dust—and small animals.

By simply adding a small amount of dehydrating agent before slipping on the easily fitted caps, the inside of expensive alloy tube stock is protected from corrosion. Ideal, too, for threaded pipe, the new caps retard drying of thread dope and keep the threads free of sand and grit.

Two types are currently available: a lightweight roll-on cap for pipe 2 to 10 inches in diameter; and a heavier, slip-on cap for 2- to 20-inch diameter piping. The standard slip-on covers have a wall thickness of about ⅛ inch.

Because they are made of rugged Du Pont neoprene, the new end caps will stand up to rough handling and repeated re-use. Unlike ordinary rubber, neoprene also is highly resistant to oil, acids and other chemicals, sunlight, and weather.

While the new caps were designed primarily for stored piping, they are equally effective for protecting heat exchanger tube bundles, well casing, and various other tubular goods for oil field and refinery applications.

Portable Pipe Benders

M-8 The **Tal Bending Equipment, Inc.,** Milwaukee 2, Wisconsin, announces its newest: Tal One Shot Giant Portable Benders. They bend 8" pipe, and larger sizes, to any degree up to 90° in one single setting. It takes 3 minutes actual bending time, with a 2 hp motor pump, to make a 90° bend in the field on 8" pipe.

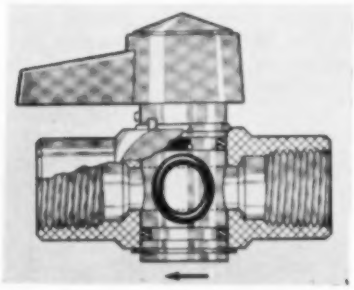
It can also be used with a ½ hp motor or gasoline motor.

The frame can be folded together onto the top of the hydraulic ram, making it easy to assemble or disassemble and practical for transportation from shop to job, or vice versa. Streamlined built, they are far the lightest in weight and lowest priced for benders of large capacity. They are easily operated and reduce labor and material cost to a minimum. Pipe size ranges are from the smallest up to the desired sizes. Similar benders can be had in smaller sizes up to 2", 3", 4" and 5". Also available is an attachment for making 180° bends in one shot for all pipe sizes.

These benders can also be obtained with a built-in integral frame and hoist for handling materials in the field.

Plug Valve

M-9 A new plug valve that provides absolute leakproof shut-off operated by a handle that opens and closes against pressure with absolutely no effort is now being manufactured by **Circle Seal Products Co., Inc.**, 2181 East Foothill Blvd., Pasadena 8, California.



The new design of the plug features the ingenious use of three "O" rings. In the closed position, one "O" ring contained on the surface of the plug (90 degrees from the flow passage through the plug) serves as a flow seal. This flow seal "O" ring surrounds the inlet port and provides dead-tight shut-off. In the open position, the valve is full ported and allows a straight-through flow passage. Static "O" rings at the top and bottom of the plug and around its circumference positively prevent stem leakage.

The use of the "O" rings eliminates adjusting nuts and springs, and therefore permits the long adjustment- and maintenance-free service life of the valve.

The plug valve is made of brass and is available in ¼ inch female pipe connections.

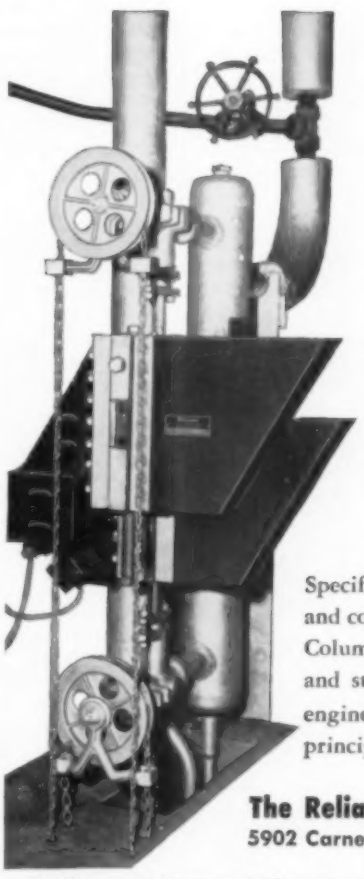
Internal Gear Rotary Pumps

M-10 Five new series of internal gear rotary pumps have been announced by the Industrial Division of the **Wayne Pump Company**, 114 Tecumseh St., Fort Wayne, Indiana. The new products, offering versatility in the field of positive displacement liquid pumps, employ Wayne's circular tooth design in their rotors and idlers. This design feature is claimed to provide rolling contact and smoother engagement of teeth, resulting in a reduction of friction and in high volumetric efficiency.

Standard duty pumps titled, "Series A", consist of 10 basic sizes from 3

Reliance Water Columns

Gages and Safety Specialties assure you the utmost in *Dependability*



Since 1884, Reliance has maintained leadership in Boiler Safety Device development and manufacture. Water Columns with automatic Alarms, operated by the original *instantaneous* alarm mechanism, have helped to fortify power plants against the consequences of boiler water failure for billions of operating hours. Whistle alarms are available on columns for pressures to 900 psi; electric alarms, actuated by Reliance Electrode Levalarms, to 2500 psi.

For higher pressures — to 2500 psi — Reliance standard and custom-built equipment embodies principles of design and construction perfected in 70 years of *specializing* in this field—"super-rugged" Water Columns built with a generous margin of safety and tested at twice rated capacity.

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Gage Inserts: Prismatic, Mica-protected Flat Glass, "Micasight"
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Complete Line of Water Gage Illuminating Equipment
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Levalarms — Float-type Liquid Level Alarm Devices
Levalarms — Electrode-type Liquid Level Alarms, Fuel Cut-out and Pump Control

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Standard greensand, hi capacity greensand, synthetic gel, sulfonated coal, resin polystyrene, sodium and hydrogen ion exchangers, hot process

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to over 100 gpm maximum capacities in two speed ranges up to maximums of 650 and 1800 rpm. The group is designed to handle liquids of light to medium viscosities at pressures to 125 psi.

"Series B" pumps are generally similar to "A" pumps, but they are approved by Underwriters' Laboratories for handling hazardous liquids such as naphtha and benzene, and are distinguished by a special stuffing box, and an alternate mechanical seal.

For heavy duty applications Wayne offers its "Series C" group, consisting of 650 maximum rpm pumps with maximum capacities in excess of 300 gpm. The group is applicable to bulk station uses, truck mounting and other extremely rugged applications. Medium to high viscosity liquids are pumped by units in this group.

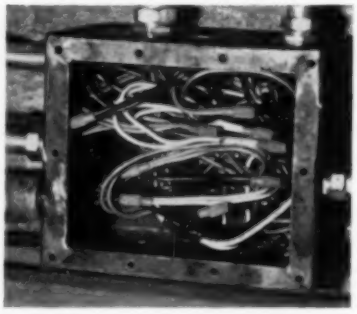
LP gases and other highly volatile substances are handled by "Series D" units at up to 100 gpm. They are distinguished from the "C" group primarily by a mechanical seal arrangement.

Asphalt and other materials of medium to high viscosities requiring a heated circuit and pump utilize the steam-jacketed "Series E" group, a modification of the "C" group.

All five series can be supplied unmounted or completely assembled with motor, gear-motor, direct drive and V-belt bases.

Wire Splicer

M-11 A new, spring type, electrical wire connector that makes solderless, ready-insulated splices in one step without tools has been made nationally available by **Minnesota Mining and Manufacturing Co.**, Dept. D6-274, St. Paul, Minn.



Called the "Scotchlok" brand Type R connector, it is said to provide a vibration-resisting pig-tail splice that

Seasons Greetings
We take time out to expres our thanks and good wishes to all
MERRY CHRISTMAS and a HAPPY NEW YEAR
CATAWISSA VALVE & FITTINGS CO.
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holds regardless of thermal or mechanical changes.

Expected to be widely used by electrical contractors and for plant maintenance, the new connector is approved by Underwriter's Laboratories as meeting all requirements for high and low voltage building (1000 volts maximum) and fixture (600 volts maximum) wiring.

The new connector consists of a cone-shaped coil spring within a steel shell to prevent crushing in crowded junction boxes. The vinyl insulating jacket—molded over the unit—features a triangular cross-section for a better finger grip during application. It also includes a skirt at the bottom to protect the wires and prevent flashover.

In use, the new connector is simply screwed on the ends of the wires to be spliced — the cone-shaped spring construction providing threads and gripping the wires firmly under constant tension.

The pre-insulated connector is suitable for use on wire sizes from No. 10 to No. 16 AWG in 64 possible combinations. A complete list of wire size combinations is printed on each box.

"Scotchlok" Type R connectors are packed 100 to a box with 10 boxes in a shipping carton.

"Gard-It" Switch Protects Water Systems

M-12 The **Furnas Electric Company,** 1047 West McKee Street, Batavia, Illinois, announces a new "Gard-it" low pressure cut-off switch for water system protection.

"Gard-it" stops pump operation when water pressure falls below a safe, predetermined operating level.

Pumps and water cooled motors are protected when water level in well drops below intake of drop pipe and operating pressure falls to cut-off point.

The "Gard-it" low pressure cut-off switch, rated at 1 horsepower, 110-220 volts a-c, is actuated by operating pressure from pump.

"Gard-it" operates on the principle that when pressure drops to 5 or 6 pounds contacts will interrupt line voltage to pressure switch, stopping pump operation. Pumping is resumed by depressing reset button.

Electric Power Sweeper

M-13 The only battery-powered industrial sweeper that does a full day's work without stopping has been introduced by the **Wayne Manufacturing Company,** 1275 E. Lexington Ave., Pomona, Calif.

This latest addition to the Wayne power sweeper line, Model 605-E, sweeps up to 70,000 sq ft of open area per hour.

The sweeper can work an eight-hour shift before it needs recharging because it operates on two motors, one powering the vehicle and the second the brooms and dust control system.

When traveling but not sweeping, only the motor is used, thus saving the batteries. A built-in battery charger makes recharging a simple matter of plugging into any 110-volt outlet.

Exclusive in the sweeper is three-speed forward transmission with one speed in reverse. This provides gear ratios for most efficient performance under all sweeping conditions, including steep grades.

Temperature Regulator

M-14 A new self-actuated vapor pressure temperature regulator developed by **Klipfel Valves, Inc.,** Hamilton, Ohio, provides accurate, positive, low cost control for installations where danger of overheating, product spoilage or equipment damage is feared.

Known as the "Golden Genie" because of its golden finish, the regulator is ideal for the control of hot water tanks, instantaneous heaters and steam tables. It also offers precision control for oil heaters, textile dryers and oil preheaters, as well as cooling for diesels, and cooling jackets of compressors or engines.

Components of the Klipfel temperature regulator are an extra-powerful bellows actuator connected by capillary tubing to a temperature sensitive bulb. The actuator is mounted on top of a yoke connected to the valve. The bellows supplies the power for controlling the valve opening in response to the temperature changes at the bulb.

The bulb is placed in the tank or other location where desired temperature is to be maintained. The valve is installed in the pipe line supplying steam, water, gas or other fluid to be used for heating or cooling.

A temperature change at the bulb alters vapor pressure of the bulb fluid. This pressure change is transmitted through capillary tubing to the bellows actuator, which instantly and smoothly changes the valve opening to hold desired temperature in the system.

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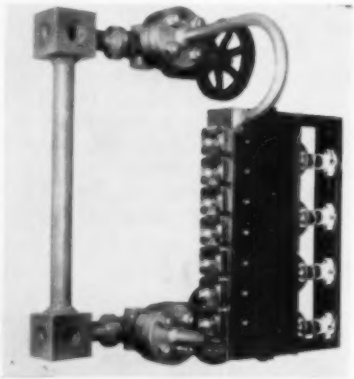
Color-Port Water Gage

M-15 Brilliant two-color red and green readings and greatly reduced maintenance are two of the outstanding features of the new Yarway Color-Port Water Gage announced by **Yarnall-Waring Company,** Mermaid Lane, Philadelphia 18, Pa.



Yarway Color-Port Water Gages are designed for high pressure boilers, up to 3300 psi. In the port-type openings, water shows green, steam shows red. Thus, a full gage is all green, an empty gage all red. The individual cover-glass assemblies permit quick and easy servicing of the gage in place, without removal from the boiler. Large diameter port openings give increased visibility, and a variety of mirror arrangements bring the brilliantly lighted, head-on view of the gage face to convenient operating-floor locations.

Electro-Pneumatic Valve

M-16 An electrically - operated air valve that doesn't talk, hum, or chatter was announced recently by the **Powers Regulator Company,** 3434 Oakton St., Skokie, Ill., manufacturer of automatic controls.

Closely - held spring, armature, guide, and material tolerances prevent alternating current hum and other noise usually present in such controls.

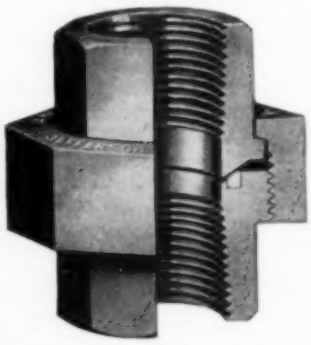
The electro - pneumatic valve is recommended for noiseless control of air conditioning damper motors, as well as for control of pneumatic motors and valves on industrial equipment.

When electrically energized, the valve will pass full air at supply pressures up to 25 pounds. When not

Jefferson

A-4

PIPE UNIONS



convincingly prove their high quality and dependability

The outstanding high quality of JEFFERSON UNIONS has been proven time and again in a diversified field of industrial users. Maintenance men, engineers, master mechanics and boss pipe fitters have been completely convinced after trial and test that JEFFERSON UNIONS really effect savings in both installation and maintenance.

The reasons for all this are easily accounted for: air refined malleable iron castings are used having an average tensile strength of 55,000 Lbs. P.S.I. so that Jefferson A-4 Unions are safely recommended for 500 Lbs. P.S.I. STEAM and OIL at 500° F. or 2000 Lbs. P.S.I. NON-SHOCK COLD W.O.G. in sizes ⅛" to 2". Seat rings are cut from specially drawn hard brass tubing, obviating the porosity in cast brass seats. Seats are ground together not just machine-finished and can be furnished either in brass-to-iron or iron-to-iron.

All JEFFERSON products are air-tested and inspected to insure tight joints when installed, for the protection of all users and carry U.L. approval when used in the services for which they are recommended.

Included in the complete Jefferson line are: 150#, 250# and 300# unions, union elbows, union tees and flange unions.

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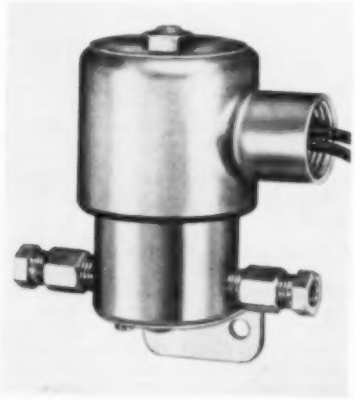
energized, the valve will waste air from its outlet port and close the inlet. A built-in manual adjustment permits the valve to pass air when the coil is not energized.



The 60-cycle coil can be supplied for voltages of 115, 208, 230, or 440. Twelve-inch electrical leads come from a rotating housing to facilitate wiring. Port connections are ⅛-inch NPT. The valve is Underwriters' Laboratories approved.

Repairing Machinery and Metal Parts

M-17

Devcon-The Plastic Steel is a combination of 80% steel and 20% plastic. This new product is as easy to use as modeling clay. Two hours after the addition of a special hardening agent, the mixture becomes a rigid, tough, strong, steel-like mass. Once hard, it can be sawed, drilled, threaded or ground with regular metal working tools.

Devcon was developed originally for use by the metal working industry for making tools, jigs, fixtures, molds, dies, models and for similar uses. It was soon found that Devcon was an excellent adhesive for metals and could be used for bonding steel, iron, bronze, brass, aluminum and lead to themselves, to each other, or to many other materials including glass, porcelain, concrete and wood. As a result, Devcon is now being used in large quantities for rebuilding broken machinery, filling large and small holes in castings, building up worn metal surfaces on machine tools, repairing stripped threads, bearings, and for many similar applications.

Devcon-The Plastic Steel is manufactured and sold by the **Devcon Corporation,** Danvers, Massachusetts. Two types are now available: Devcon A is a putty type that can be applied to a vertical surface and will not run or sag; Devcon B is a viscous liquid that can be poured. Both consist of 80% steel and 20% plastic and have a compression strength of approximately 18,000 psi. There is practically no shrinkage during hardening and, once set, they are durable and permanent.

Devcon is extremely simple to use. No special training is required. A special hardening agent is supplied with every can of material. All you have to do is add the hardener to the plastic, stir it with a screwdriver, then press or pour it into the shape you desire. Two hours later, it has hardened to a rigid piece of metal that can be machined like steel. No heat or pressure is required. In fact, it will harden under water.

A trial kit of Devcon-The Plastic Steel sells for $11.40 and contains two pounds of Devcon A, the putty type, two small jars of A hardener, two pounds of Devcon B, the liquid type, and two jars of B hardener. It also includes two small measuring spoons and complete instructions.

A MUST in every factory wash room and on-the-job locations

VI-LAN CLEAN powered with ACTAMER* for Dermatitis Control

For easy filling of dispensers VI-LAN CLEAN is furnished in polyethylene bags thru which you may squeeze all or as much as is needed into the dispenser without waste. The bag may also be used as a portable dispenser on trucks and outside jobs. VI-LAN CLEAN also is available in convenient pint, quart and gallon containers for home and shop use. Write NOW for descriptive folder.

- ACTAMER* is a new bacteriostat of superior effectiveness, and tests have shown that VI-LAN CLEAN with ACTAMER reduces resident skin bacteria by as much as 97%.
- VI-LAN CLEAN does what soap can not do. It cleanses while it guards hands, face and body against skin contaminations. It removes greases, oils, paints, acids, printing inks, asphalt, rubber and gasket cements. It is non-irritating. It contains lanolin to restore normal skin qualities. It may be used with or without water.
- For safety sake, for cleanliness, to prevent lost man hours, absenteeism and expensive compensation claims, give your employees the protection of VI-LAN CLEAN.
- Place VI-LAN CLEAN dispensers in all wash rooms and in critical on-the-job locations, to economize and to speed your employees wash-ups.

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Better Production Ideas and Methods

FOR FREE INFORMATION—Circle code number on page 17 or 18

X-1—Hydrazine Solution—16 page illustrated booklet covers in detail the use of Scav-Ox, a 35% hydrazine solution for removing dissolved oxygen from boiler feedwater, for protecting low, medium and high pressure boilers. It discusses determination of dosage, recommended methods of application, testing methods and properties and handling of the material and presents comprehensive operating data in the form of case studies in each of the three boiler classes. — INDUSTRIAL CHEMICALS DIVISION OF OLIN MATHIESON CHEMICAL CORP., Baltimore 3, Md.

X-2—Prefabricated Piping—28 page Catalog No. 100 describes EBKC prefabricated insulated piping systems—underground and overhead—for steam, condensate, hot or chilled water and other fluids. Complete information, including technical data, on the design, applications and installation is given.—E. B. KAISER CO., Glenview, Illinois.

X-3—"Safeguard" Rotameters—Bulletin 18RG describes company's line of Series 18200 "Safeguard" Rotameters, versatile "variable area" type instruments for the accurate measurement of fluid rate-of-flow. Gives detailed data on application, construction, operation and installation of "Safeguard" Rotameters and pictures and describes the various types which make up the complete line. Sizes and dimensions are given in tabular form.—SCHUTTE AND KOERTING COMPANY, Cornwells Heights, Bucks Co., Pa.

X-4—Flow Valves—4 page Bulletin 500 covers the design, function and specifications of 8 types of Coppus Sentry Full Flow Valves. — COPPUS ENGINEERING CORP., Worcester 2, Mass.

X-5—Pressure & Temperature Control—4 page, illustrated Bulletin 979 contains full technical specifications on Type 57 pneumatic recording controller and Type 58 recorder with pressure ranges from 0-5 to 0-25,000 psi and temperature ranges from —350 F to 1200 F. A variety of models for both types is available.—A. W. CASH CO., Box 551, Decatur, Ill.

X-6—Industrial Friction Materials—16 page, illustrated booklet covers asbestos brake blocks, linings and clutch facings. Describes sections on moulded asbestos friction materials, woven materials and assembled sets for servicing popular industrial machines. Includes section on design data, with most of the information arranged in chart form for easy reference.—JOHNS-MANVILLE, 22 East 40th St., New York 16, N. Y.

X-7—Dreadnaught Batteries—Bulletin No. GB 1668-B gives full details of battery construction, including Tite-Seal posts, basic Z grids, regenerative oxide material, Platainers, glass retainers, rubber separators and element protectors. Lists engineering specifications for the three available amper-hour capacities (40, 60 and 120) and tabulates length and width dimensions for groupings of cells in wood or steel trays for rider-type trucks. — GOULD-NATIONAL BATTERIES, INC., Trenton 7, N. J.

X-8—Pipe Hangers—16 page Bulletin 156 describes Counterpoise and Levelglide Hangers. Gives specifications for the entire line, engineering drawings of all models, weight-load selection tables, and erection and adjustment information.—NATIONAL VALVE & MFG. CO., 3100 Liberty Ave., Pittsburgh 1, Pa.

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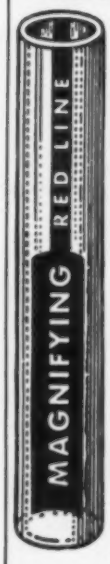

FIG. 22 SERIES 750

FIG. 21 LIP-MOLD

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See Pages 16-19

X-9—Insulated Stack — Illustrated Folder No. IS-28 contains product information, including advantages and description as well as specifications, suggested installation methods and test data for the Pre-Cast Insulated Stack.—VAN-PACKER CORP., Bettendorf, Iowa.

X-10—Heat Exchangers—8 page Bulletin FH-3 describes the heat-transfer characteristics of the company's longitudinal fin tubes, which feature U-shaper fin channels integrally bonded to the tubes by heliarc welding. Includes a table of dimensions, a type of designation table and finside coefficient and finside pressure-drop charts for all sizes of exchangers.—ALCO PROD-

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UCTS, INC., Box 1065, Schenectady, N. Y.

X-11—Weldless Repairs—Technical Bulletin No. 14 describes the new method of making weldless repairs to iron and steel tanks, conduits, containers and surfaces. Gives details of the repair procedure from start to finish, including preparation of the damaged metal, preparation of the glass cloth patches, mixing of the resin, and curing of the final patch. Also gives data as to the proportions of epoxy and curing agent to be used.—SMOOTH-ON MANUFACTURING CO., 572 Communipaw Ave., Jersey City 4, N. J.

X-12—Valves — Bulletin 456 describe Keystone Valves which shut off completely against low pressure or vacuum as well as the full line pressure for which it is rated. Gives the outstanding features of the valves along with tables covering size, weight and price. Well illustrated. — KEYSTONE VALVE CORP., Box 6716, Houston 5, Texas.

X-13—Bore Type Couplings—Catalog V-169-E contains data on fixed bore, chain, flexible and rigid couplings. Includes list prices and specification, selection, rating, bushing bores and standard keyseats charts. — BROWNING MANUFACTURING COMPANY, Maysville, Ky.

X-14 — Vertical Turbine Pumps — Bulletin WO-53 describes the water and oil lubricated vertical turbine pumps, their application, and pump drive heads designed for water wells serving industry, municipality and agriculture.—LAYNE & BOWLER, INC., Memphis 8, Tenn.

Book Review

Applied Thermodynamics

BY E. B. NORRIS, ERIK THERKELSEN, AND CLARENCE E. TRENT

PUBLISHED BY MCGRAW-HILL BOOK CO., INC.

330 West 42nd Street, New York 36, N. Y.

490 pages

Price, $7.50

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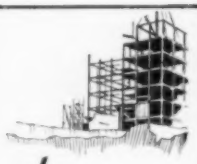

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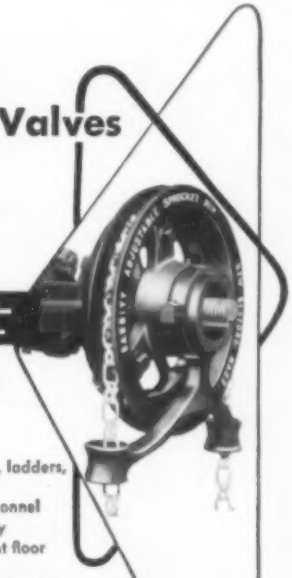

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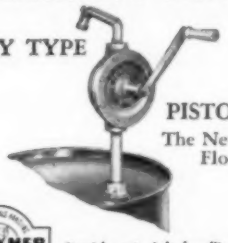

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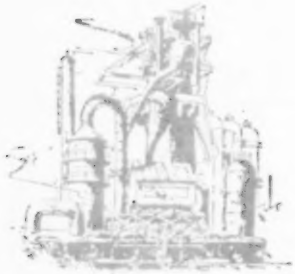

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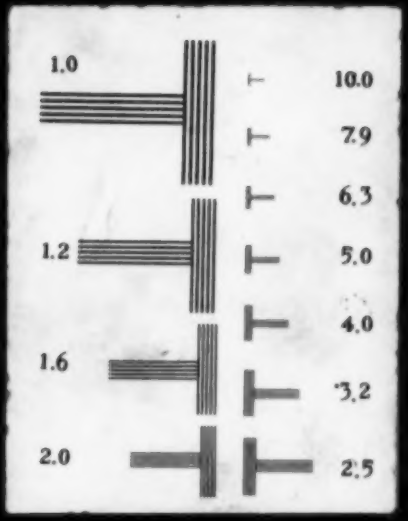
RESOLUTION CHART



100 MILLIMETERS

INSTRUCTIONS Resolution is expressed in terms of the lines per millimeter recorded by a particular film under specified conditions. Numerals in chart indicate the number of lines per millimeter in adjacent "T-shaped" groupings.

In microfilming, it is necessary to determine the reduction ratio and multiply the number of lines in the chart by this value to find the number of lines recorded by the film. As an aid in determining the reduction ratio, the line above is 100 millimeters in length. Measuring this line in the film image and dividing the length into 100 gives the reduction ratio. Example: the line is 20 mm. long in the film image, and $100/20 = 5$.

Examine "T-shaped" line groupings in the film with microscope, and note the number adjacent to finest lines recorded sharply and distinctly. Multiply this number by the reduction factor to obtain resolving power in lines per millimeter. Example: 7.9 group of lines is clearly recorded while lines in the 10.0 group are not distinctly separated. Reduction ratio is 5, and $7.9 \times 5 = 39.5$ lines per millimeter recorded satisfactorily. $10.0 \times 5 = 50$ lines per millimeter which are not recorded satisfactorily. Under the particular conditions, maximum resolution is between 39.5 and 50 lines per millimeter.

Resolution, as measured on the film, is a test of the entire photographic system, including lens, exposure, processing, and other factors. These rarely utilize maximum resolution of the film. Vibrations during exposure, lack of critical focus, and exposures yielding very dense negatives are to be avoided.